

**University of Reading**

**Is there a better way to  
analyse the business environment?**

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## **Executive summary**

The focus of this thesis is an investigation of a new method for modelling the business environment. This thesis recognises the key importance of deep and timely knowledge of the business environment for strategy development and effective continuous execution. Further, it identifies issues relating to the effectiveness of the business environmental modelling task both in professional practice and in business education. Reports in the literature of a failure of businesses to engage in effective environmental scanning are corroborated in this thesis by evidence gathered in a workshop session with MBA students.

First, this thesis introduces a new method for modelling the business environment, called PESTLEWeb. In the first instance, it is intended that this method be used in an academic setting, particularly in support of teaching the analysis of context for strategy development. Consequently, this thesis adopts a rigorous academic approach to the methods evaluation.

It is argued that the PESTLEWeb method has several properties that distinguish its effectiveness compared to traditional keyword-driven methods of identifying, analysing and synthesising business environmental knowledge. Properties of the new method are investigated experimentally and then separately by an observational study in a practical workshop setting. Results of a longer-term follow-up review of workshop attendees' application of the method are also reported

Results from the experimental portion of the research are presented. These include an investigation both of the cognitive aspects of the tool and subjects' affective responses to it. In regard to cognitive performance, no strong evidence is reported to indicate that the detail contained within the PESTLEWeb model is significantly more memorable than a text-based analysis. However, a measure of affective variables for subjects shows a strong statistically significant preference for the new method in terms of subjects' judgments of how logical, rational and convincing the models are.

Results from the observational study show that the method may be introduced to an MBA class in a relatively short and straightforward workshop setting. It is shown that

learners are able to understand and use the method to some extent within the workshop itself. A longer-term follow up of a self-selecting group of workshop students demonstrates that some, at least, are able to develop sophisticated and rich models of the business environment using the PESTLEWeb method.

Recommendations from this thesis include an incremental process of further investigation and academic engagement with the PESTLEWeb method with the ultimate aim of introducing it into business education. Such a process would involve continuing with the current research through experimentation and further workshop sessions and engaging in academic research seminars in order to refine the method and expose it to further critique.

## **Acknowledgments**

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I would like to thank the MBA students of Henley Business School who contributed to this work by taking part in both the experimental study and a workshop on the PESTLEWeb method. In particular I would like to thank the members of the Picasso study team who provided helpful feedback about the method during our exam preparation.

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# 1 Introduction

## 1.1 Problem statement

The focus of this thesis is an investigation of a new method for modelling the business environment. From an academic standpoint, the need for such a method arises from two threads in the literature. Firstly, that understanding the business environment plays an important role in strategy development, an idea that has recurred over an extended period in the literature of business strategy (Aguilar, 1967; Andrews, 1980; Barney, 1991; Drucker, 1994; Horton, 2010). Secondly, the observation that this task is frequently not done well (Fuld, 2003; Schoemaker, 2008; Schoemaker and Day, 2009).

At a practical level, the motivation for this thesis arose from the difficulties experienced by the author and his MBA study team when attempting to analyse various business case studies. In particular, whilst it was simple enough to apply the common 'PEST' or 'PESTLE' (Political, Economic, Social, Technological, Legal and Environmental) acronyms and generate a list of discrete issues relating to the business environment, it was nevertheless much more difficult to synthesise these 'atomic' facts into a coherent argument. My team were not alone in that difficulty and indeed the course tutors had already identified this as a general problem:

*In carrying out a PEST or PESTLE analysis it is all too easy to produce lists of factors, many of which may be of little or no importance in developing strategy... Developing a clear understanding of the cause-and-effect relationships between the factors in the PESTLE model is more challenging.*

Tovstiga and Aylward (2008)

It was thus apparent that whilst a common issue in business strategy development (at least in education) had been identified, no solution was readily available. The method described in this thesis was created by the author during the course of his MBA study to address this issue: how to model the business environment in a manner that captures rich, cause-and-effect relationships. The issue was how to build a model that captures complexity and multi-dimensional relationships and enables rationale inferences and deductions to be made. In particular, a method was required that enabled both business students and practicing business strategists to elicit, externalise, capture and disseminate

coherent arguments about the business environment and to act as both a tool for thinking and as a repository for Knowledge Management.

In the first instance, it is intended that the proposed method be used in an academic setting, particularly in support of teaching the analysis of context for strategy development. Consequently, this thesis adopts a rigorous academic approach to the methods evaluation.

## **1.2 Relationship of the project to the terms of reference and to personal objectives**

The solution proposed to the issue identified in Section 1.1 is a graphical model that has been termed 'PESTLEWeb'. This name is intended to signify both its main focus (PESTLE issues in the business environment) and the idea that this is expressed in a 'web' or 'network' of causatively related threads. Such a model specifically addresses the issue of 1.1 since it effectively encodes not only the discrete 'items' or 'issues' of the domain of interest but also the rich web of relationships between them.

The PESTLEWeb model is a direct development of earlier graphical notations developed by the author in the field of complex systems engineering (Collins, 1997a,b). These models were themselves derived from earlier work in visual argumentation (Toulmin, 1958; Schmidt 1986), cognitive maps (Eden, 1989, 1992; Eden *et al*, 1992; Bougon, 1992), soft-systems methodology (Checkland, 1993) and the representation of complex technology systems (Shlaer and Mellor, 1992; Selic *et al*, 1994; Hoare, 1985).

As such, the PESTLEWeb model and this thesis relate directly to the author's personal objectives as stated in his original application form for the Henley MBA:

*I have a great interest in teaching and research. I believe that some of my research background in complex systems engineering and psychology has applications within strategy development and corporate finance. ... I could see that doing an MBA would open opportunities for research and teaching.*



The PESTLEWeb model is just such an application of tools and methods from complex systems engineering and psychology to the domain of business strategy development.

This objective was further refined in the proposal for the project on which this thesis is based:

*The proposed project is only the first step of a larger programme of research I have in mind in the domain of Visual Analytics for analysis and synthesis of business strategy.*

It is clear from the research presented within the following thesis that many interesting avenues of enquiry remain unexplored. Some of the core questions, for example relating to ‘usability’ in a classroom setting, have been addressed but other questions have arisen, such as in the area of individual difference, the nuances of the notation and its long-term effectiveness in professional practice. It is thus reasonable to say that the current work has provided a useful basis for a larger programme of research.

Another objective of the project is summed up in the following terms in the original research proposal:

*... this [research] could provide a powerful and effective curriculum resource for Henley Business School (the research will show if this view is correct or not). If successful this project will result in a ‘Henley Branded’ model/method for analysing the business environment and produce a valuable tool for teaching.*

The experimental and observational studies documented within this thesis directly address the efficacy of the PESTLEWeb model within a business school teaching environment.

A final objective is that the publication of this thesis will represent a next step towards the eventual goal of adoption of the PESTLEWeb as a teaching resource within Henley Business School and beyond.

### **1.3 Structure of the thesis**

A ‘prologue’ to this thesis (Section 2) presents a brief introduction to the PESTLEWeb modelling method. This section is introduced to provide a context and motivation for the sections that follow. In practical terms, both the literature review and the investigation make more sense following an explanation of the PESTLEWeb modelling convention itself.

The thesis proper begins with a review of current thinking (Section 3). The argument presented within that review may be summarised thus:

1. Successful business strategy crucially depends on developing a rich, accurate and timely understanding of the business environment.
2. Scanning of the business environment is frequently not done well.
3. Visual argumentation is a powerful and effective tool to support analysis, understanding, communication and reasoning from complex multi-dimensional datasets and hence is appropriate in this problem domain.

Major sections within the review address each element of this argument in turn.

The tutorial and review sections are followed by an investigation of issues relating to the efficacy of the PESTLEWeb method (Section 4). The investigation is separated into two major sections:

1. An experimental procedure intended to rigorously test the hypothesis relating to the cognitive and affective properties of the method; and
2. A workshop-based ‘observational’ procedure intended to test the method in a more realistic practical setting.

Each of these sections follows the pattern of presenting objectives, followed by the design of the study and finally findings and analysis.

Both of the studies are brought together and discussed within the Conclusion and Recommendations (Section 4.5).

The final section of this thesis presents a critical reflection on the content of the thesis, conduct of the project and the learning that has taken place as a result (Section 5).

## 2 Introduction to PESTLEWeb

### 2.1 Drawing conventions

At its core, PESTLEWeb is based on the ubiquitous PESTLE tool that is used to support the identification of Political, Economic, Social, Technological, Legal and Ecological issues in the business environment (Thompson and Martin, 2005). However, PESTLEWeb is a drawing convention rather than a tabulated, textual analysis.

The base building-blocks of PESTLEWeb are a series of boxes labelled to represent each element of the PESTLE analysis. These boxes are coloured in order to aid identification and differentiation. Those base elements are then joined with directed lines representing the causal relationships between elements.

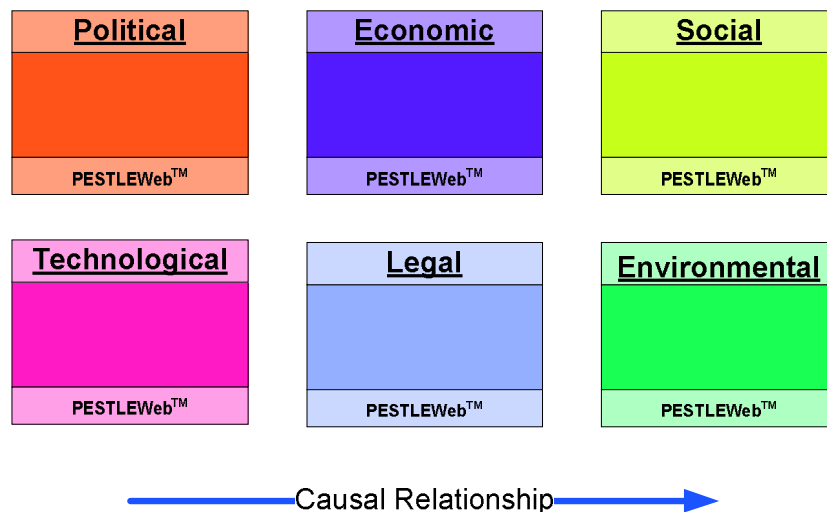
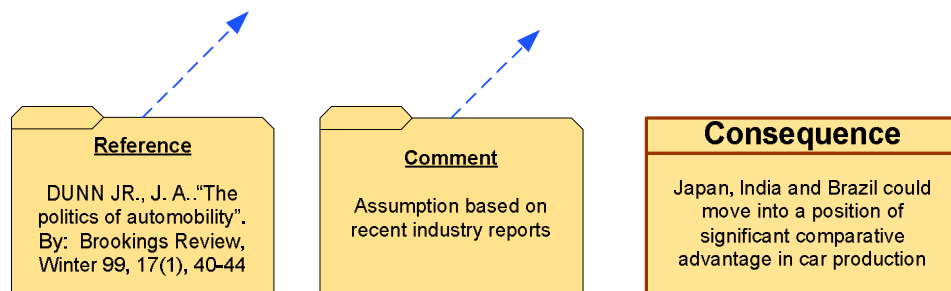


Figure 1: Core Elements of the PESTLEWeb Drawing Convention

In order to be useful for analysis, as well as representing PESTLE issues and their causal relationships, it is also important to be able to identify the logical consequences of those causal relationships. This is particularly true because, to be productive, we need the analyst to move from an abstract analysis of the business environment to the specific consequences that impinge on their own business.

Additionally, it is a common convention in the more formal diagrams of software engineering to include drawing elements that enable annotation and comments. Such elements may sit apart from the formal ‘modelling’ (representational) elements of the diagram, enabling a reader to better understand the diagrams. Within the PESTLEWeb notation, we include a generic ‘comment’ symbol and a specific variant of a comment used to indicate source references for further information. The latter symbol enables the diagram to be embedded within a richer network of source information.



**Figure 2: Reference, Comment and Consequence Elements of the PESTLEWeb Drawing Convention**

Finally, the convention includes an element to annotate relationships between elements that are not causal in nature. These elements are intended to be less ‘powerful’ in the PESTLEWeb model than in the causal relationship element identified above. Rather than expressing a consequential logic, they represent a more generic association between elements. These two types of connectivity between elements (causal and relational) have previously been shown to be useful in a similar context in a diagrammatic notation introduced by the author (Collins 1997a; 1997b)

Consider, for example, Figure 3, which shows two elements from a PESTLEWeb analysis of the automotive industry. The two issues in the diagram are not causally related, but there is an important relationship or association that the analyst wants to emphasise in the model. This association may be implicit or the joining line may be labelled explicitly with the nature of the association. Such associations may also be annotated with ‘comment’ elements.

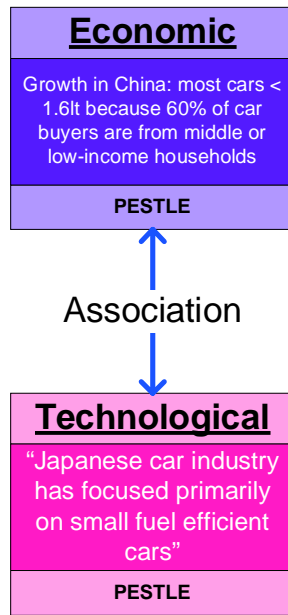


Figure 3: Illustration of the use of a Generic Association between Elements in a PESTLEWeb Diagram

## 2.2 An example PESTLEWeb model for the automotive industry

### 2.2.1 Starting the model

This section illustrates the development of a PESTLEWeb model for the automotive industry, showing how the model is built section by section. Figure 4 shows an extract from the full model.

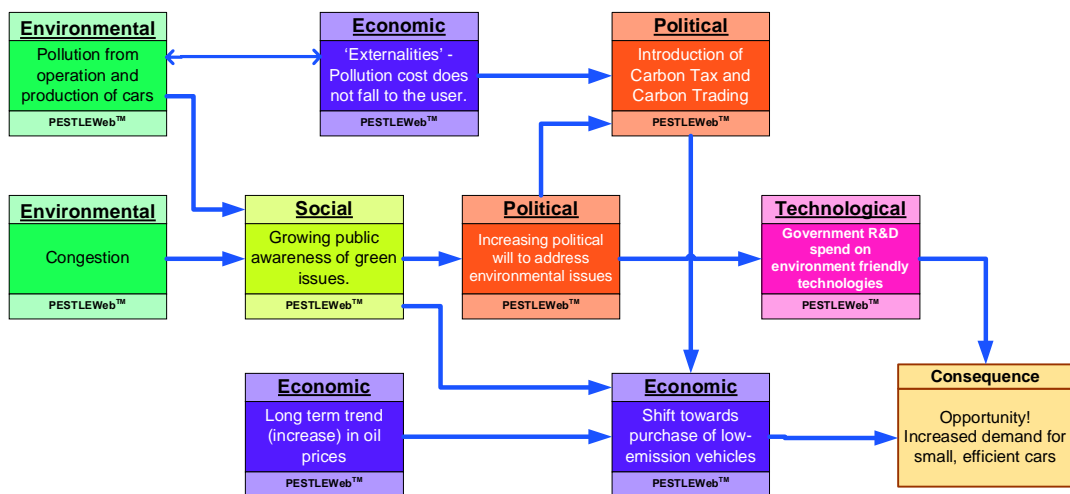


Figure 4: Part 1 of a PESTLEWeb Diagram for the Global Automotive Industry

This shows the consequential chain that leads from car pollution and congestion through the social and economic consequences of that pollution and on to the political response to those social and economic issues. Note that some of these consequences are economic and some are technological.

At the bottom right-hand side of Figure 4, we see the final consequence for a specific business that emerges from this causal logic chain. This consequence, of course, would be different depending on the circumstances of the particular business; for an automobile manufacturer producing large ‘gas-guzzling’ cars, the consequence might be a significant threat. In this example, we have shown the opportunity that may arise for a manufacturer of smaller fuel-efficient engines.

### 2.2.2 Considering consequences

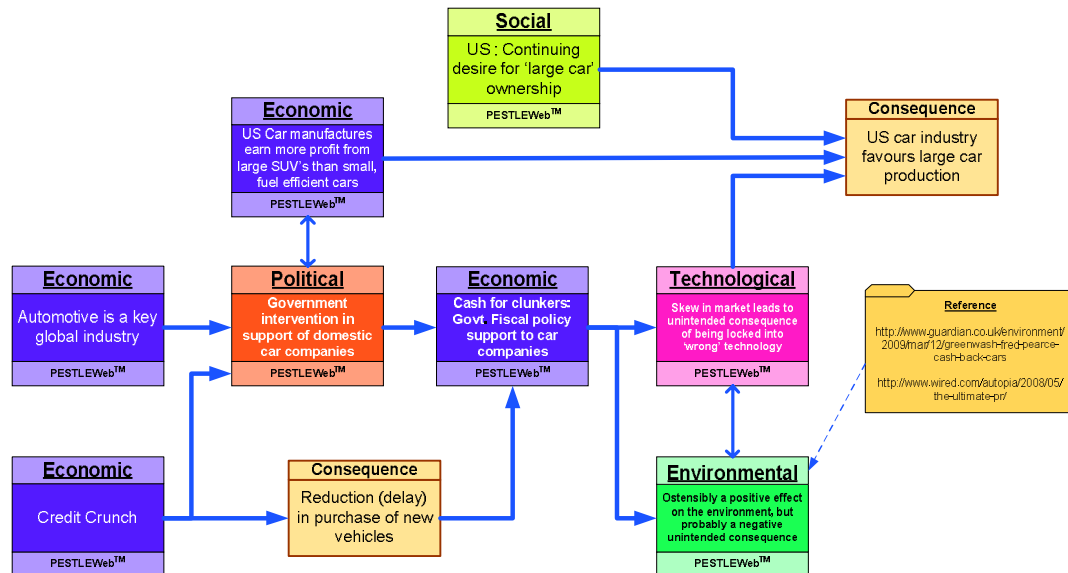


Figure 5: Part 2 of a PESTLEWeb Diagram for the Global Automotive Industry

In Figure 5, we see the development a section of the automotive PESTLEWeb model that brings together the following issues:

- The recent credit crisis and its political and hence economic ramifications for the car industry;
- Social, Economic and Technological factors leading to the US car industry being strongly weighted towards ‘large-car’ manufacture; and
- Issues of ‘unintended consequence’ of government support of existing manufacturers.

One aspect of this diagram should be highlighted to illustrate a general point about PESTLEWeb models. The ‘Consequence’ element labelled “Reduction (delay) in purchase of new vehicles” could be considered a generic “Economic” issue rather than a “Consequence”; so, why is it so labelled?

The answer is that the “Consequence” elements are the link between the general analysis of the business environment and the immediate consequences for the specific business for which the analysis is being performed. In a pure “Industry Analysis” this element might well be labelled a generic “Economic” node. However, in this case we are developing the model from the position of a business that can foresee immediate consequences and implications for their business.

In general, the “Consequence” elements will feed most directly into later stages of strategic analysis for the business. They will often appear as the ‘Opportunities’ and ‘Threats’ in a later SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis.

### **2.2.3 Threads**

‘Threads’ are series of causally related issues that run through the model. These can be considered the ‘stories’ that run through the analysis. In other words, each of the PESTLEWeb elements should be regarded neither as ‘atomic’ nor as simply connected to its precursors and consequences. Rather, analysts need to consider ‘threads’ of causally related issues in order to develop a deep understanding of the business environment. Such PESTLEWeb threads are a close analogue to those introduced by Collins (2000) and are used to explain and analyse behaviour in large-scale complex systems.

The section of the automotive industry PESTLEWeb model in Figure 6 introduces issues associated with the emerging economies and bias in certain countries towards specific types of vehicle. In the full integrated model, elements from this thread cross-linked to elements in the previous threads. The concept of threads is useful in this context because they enable coherent themes to be drawn from the interconnected network of model elements.

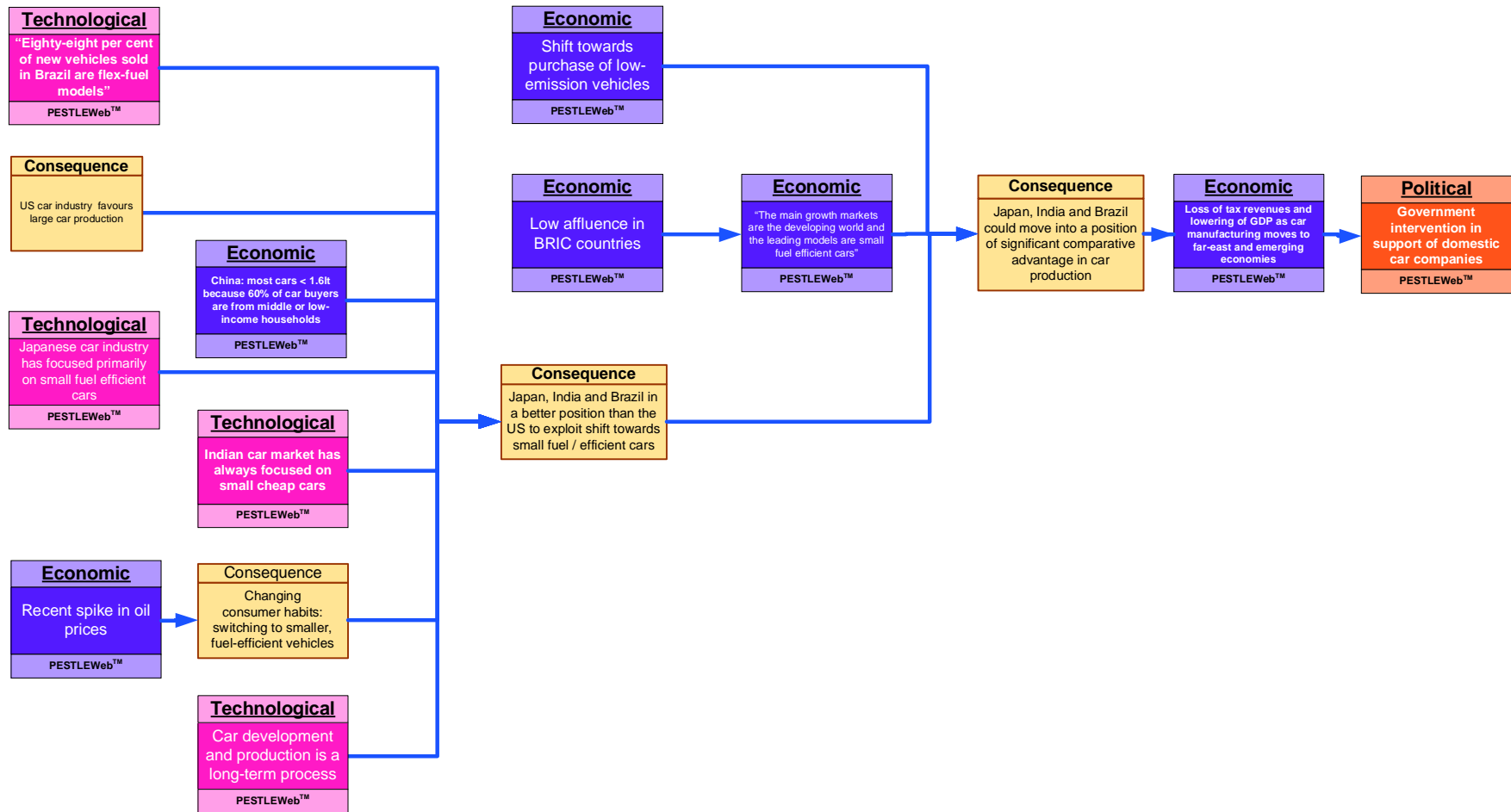


Figure 6: Part 3 of a PESTLEWeb Diagram for the Global Automotive Industry



### 3 Review of current thinking

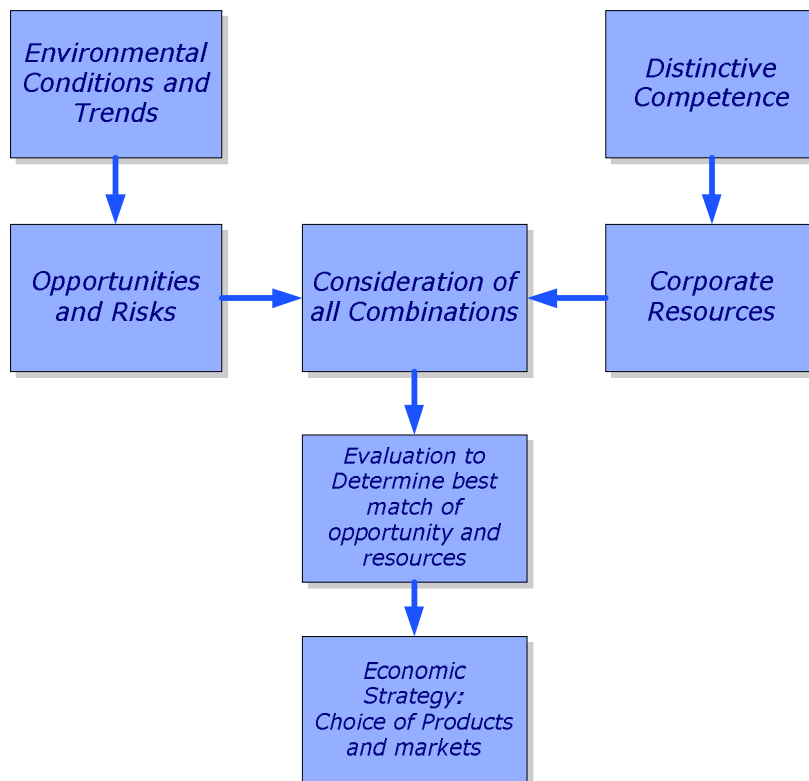
#### 3.1 Understanding the business environment

*Successful business strategy depends crucially on developing a rich, accurate and timely understanding of the business environment.*

##### 3.1.1 Environmental scanning as a key component of strategy development

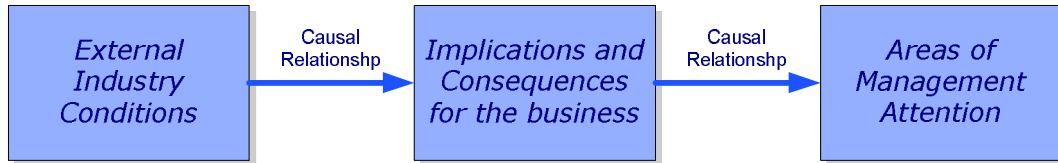
In his seminal work on strategy, Andrews posited an ecological view of strategy as the process of matching what a company can do within the universe of what it might do to a formulation of behaviour representing what it should best do (Andrews, 1980).

Andrews dedicated a whole chapter of the work to “The company and its environment: Relating opportunities to resources” and his argument is best summarised in Figure 7, which is drawn from that chapter.



**Figure 7: Development of Economic Strategy (Andrews, 1980)**

In the original work in which PEST analysis was introduced, Aguilar made explicit the structured nature of the Business Environment Scanning Task (Aguilar, 1967); that is, that there is logic of causal relationships as shown in Figure 8.



**Figure 8: Aguilar's Causal Relationships between External Industry Conditions and Areas of Management Attention**

The general logic of this process has stood the test of time and, for example, is reflected in more recent work focused on the Resource-Based View (RBV) of the firm. In particular, Barney (1991) has commented on the “complementarity between environmental models of competitive advantage and the resource-based model.” Indeed, it has been argued that the RBV specifically builds on two previous broad approaches to strategy (the internally and externally focused) by combining internal and external perspectives (Collis and Montgomery 2008).

Drucker has identified the failure to match a company’s behaviour with its changed environment as a principle cause of stagnation (Drucker 1994). Drucker is more concerned with issues of the ‘micro-environment’ pertaining to markets, customers and competitors than the issues of the ‘macro-environment’ that this thesis is focused on. However, the point is still well made; a business is embedded in a dynamic context and the leaders of any business would do well to take account of that context in an intelligent and purposeful manner. When Drucker refers to a ‘theory of the firm’ he is referring to a theory of the firm in the context of an environment. Therefore, the firm must engage in environmental scanning on an ongoing basis in order to monitor forces that may have an impact on the business (Albright, 2004).

All of this is not to say, of course, that the firm must be regarded as a passive element within its environment. This view is somewhat in contrast to the process suggested by Aguilar in Figure 8 and entails a more dynamic and co-evolutionary relationship between firm and environment. As has been cogently argued by Astley and Fombrun, a

firm is an active component within an ecology and as such may both respond dynamically to and affect the evolution of that environment (Astley and Fombrun, 1983; Astley 1984):

However, the argument here is that for this co-evolution to be strategically valuable to the firm it must be purposeful. A rich model of the external environment that enables and promotes sense-making of the environment by business leaders is a valuable component of being effectively purposeful.

It has been argued that in an increasingly dynamic, global environment strategy has much to do with 'dynamic capabilities' such as environmental sense-making. Dynamic capabilities are the "routines, activities and micro-processes by which an organisation achieves a new configuration", key amongst which is an 'early warning system' of effective environmental scanning (Horton, 2010). The argument for this is that:

*When there are high levels of ambiguity, complexity or unpredictability in the business environment, strategy must be discovery driven, involve exploration and learning using qualitative methods.*

Horton (2010)

For a firm to maintain competitive advantage it must purposefully create, codify and leverage information about an evolving business environment:

*[a] crucial component of managerial behavior in rapidly changing environments is problem sensing, the cognitive processes of noticing and constructing meaning about environmental change so that organizations can take action.*

Kiesler and Sproull (1982, cited by Barr *et al*, 1992)

Given this argument, logic would dictate that, in order to develop a good theory of the firm in an environmental context, one must first develop rich, relevant and useful theories or models of the business environment itself. The current work is focused principally on the elicitation, externalisation, development and formal representation of theories of the business environment to support such strategic sense-making.

The ability to manage such high-value and relevant information relating to the business environment is an example of what Pandza and Thorpe term a ‘high-order capability’:

*The concept puts forward the view that firms in possession of such a high-order capability are deemed able to purposefully create, extend or modify their knowledge base to respond to the shifts in a business environment.*

Pandza and Thorpe (2009)

The idea here is that effective environmental sense-making may be considered a ‘meta-cognitive skill’ for a business that has a particular role in gaining competitive advantage. This is because such sense-making is one element of an adaptive capability that enables effective and appropriate responses in a dynamic environment.

It may be for this reason that effective environmental scanning has been recognised as an important component of entrepreneurial behaviour. McEwen (2008) has argued the link between environmental scanning, organisational learning and entrepreneurial success:

*Despite the importance of the entrepreneurs' knowledge to new venture success, many are faced with a capability gap because of the discrepancy between their current knowledge and the information that is relevant to the current business environment. ... One way of acquiring and using outside information is through environmental scanning.*

McEwen (2008)

Thus, it can be seen that effective business environmental scanning has been recognised as of key importance to business strategy development and execution for several decades. The arguments have remained relevant in one form or another. It is a basic skill for business management, but performed well it may also be a higher-order business capability that enables effective responses in a dynamic environment.

### 3.1.2 Management of environmental knowledge

An organisation's ability to create and share knowledge is important for establishing and sustaining competitive advantage (Kanawattanachai and Yoo, 2007). This, together with the argument in the previous sections (that knowledge of the business environment is a valuable resource for the business) leads naturally to the conclusion that a mechanism to codify and share such knowledge would be of significant benefit to organisations.

In general, methods for representing knowledge ('codes') provide a mechanism for capture and re-use which is of economic benefit to firms:

*In today's rapidly changing business environment, an organization's ability to create and share knowledge is important for establishing and sustaining competitive advantage.*

Kanawattanachai and Yoo (2007)

However, also importantly, such codes provide a mechanism and catalyst for the development of new theories:

*Once they are available, new codes often make possible the development of new models and new theory.*

Håkanson (2007)

If businesses are to be managed effectively in complex environments, then their internal knowledge structures must in some ways reflect that complexity. This follows logically from the law of requisite variety proposed by Ashby (1958):

*Control can be obtained only if the variety of the controller is at least as great as the variety of the situation to be controlled.*

Richardson (2004)

If such internal complexity is to be useful for intentional adaptation (as opposed to a *post-hoc*, 'reactive' adaptation) then 'knowledge' of the external environment must be

either implicitly or explicitly coded within the system itself. Whilst such information could be implicitly coded, for example through a highly agile, adaptive and devolved organisational structure, the argument here is that an explicit codification is a valuable resource. This is because codification of important and relevant information for the firm (in this context strategically important knowledge about the business environment) enables 'shared cognitive sense-making'. That is, it allows company executives and leaders to develop and articulate a shared understanding of the environmental features that are important to their business (Oliver and Montgomery, 2008).

The issue is that, in practice, there can be significant inconsistency amongst leaders in a firm in their views about the business environment for that firm. It is difficult to see how there could be effective and 'intelligent' strategic alignment in the face of diverse or even contradictory views about the environment. To address the issue of diverse mental models amongst leaders within a business, Bougon has described the creation, in a workshop setting, of 'congregate, cognitive maps' (Bougon, 1992). Such maps represent the collective, consensus view of a group externalised in a graphic network. The argument being that we should be searching for a method that not only allows individuals to perform analysis of the environment, but also for those models to be externalised and communicated so as to develop consensus in a group of leaders.

The paper by Bougon (1992) thus provides a cogent argument for methods like PESTLEWeb to be used by leaders within a firm to formulate a shared, consensus view of the environment within which they operate.

### ***3.2 Criticisms of current methods and practices of environmental scanning***

*Scanning of the business environment is frequently not done well.*

#### **3.2.1 Lack of quality and quantity of environmental scanning**

As pointed out in the previous section, the value of analysis of the business environment has been repeatedly argued in the academic business literature. Nevertheless, there is significant evidence that, in practice, this activity is frequently not done well if it is done

at all. For example, a survey of 140 corporate strategists revealed that over 65% of them admitted that their organisations had been surprised by high-impact external events in the proceeding five years (Fuld, 2003).

Fewer than 20% of global firms have sufficient capacity to spot, interpret and act on the weak signals of forthcoming threats and opportunities (Schoemaker and Day, 2009). 97% of respondents to a survey by the same authors reported that their firms lacked any formal process or systems to prevent similar surprises in the future. A further survey of 100 global senior managers found that 80% of respondents perceived their future need for ‘peripheral vision’ to be greater than their current capacity (Schoemaker, 2008).

A failure to perform this important environmental scanning task can have significant damaging effects on a business. Pearce *et al* (1982) have pointed out that failure to effectively absorb information about the business environment can be a major factor in the failure of small and growing businesses. Indeed, they argue that “inattention to the world beyond the office door” is an important cause of many small business failures.

### **3.2.2 Failures in codifying and communicating environmental information**

There is evidence to suggest that even when business leaders do engage in more or less formal scanning of the business environment they may fail to draw correct insights and inferences from the data. This typically arises as a result of the difficulty business leaders have in navigating derived environmental information as a consequence of its volume and lack of organisation (Albright, 2004).

It is not enough to simply collect information about the environment. In order for the receipt of information to result in action it must be analysed and the results of that analysis must be communicated within the organisation (Albright, 2004).

Communication is important since it is rarely the case that business leaders have complete autonomy in strategic decision making. In order for the firm to be strategically aligned, there must be a degree of consensus in the ‘world view’ (*weltanschauung*) of its leaders (Kaplan and Norton 1992, 1993, 1996, 2004).

However, it has been argued that leaders' 'mental models' of the competitive environment can be rather diverse within a given organisation (Daniels *et al*, 1994). This has important implications for strategy development; if there is no clear, consensus understanding of the external environment, then how can a rational strategy (other than a highly 'reactive', emergent strategy) be developed? Business leaders may fail to integrate and communicate new information in a useful and productive manner that enables the business to gain consensus and hence react in a rational manner. Thus, Barr and Hough (1997) report an analysis of six firms' strategic responses to environmental changes and consider the organisation's ability to recognise and successfully react to those changes. An important observation in Barr and Hough's work is that there are significant differences in the mental models that leaders with a given firm have about the changing business environment.

Such differences have important consequences in terms of the ability of the organisation to recognise and react to environmental dynamics. In particular, they argue that before an organisation can adapt it must first 'understand'. That is, leaders must formulate a shared model of the environment and the implications of changes:

*Different beliefs about cause and effect have been established as a plausible explanation for differential responses to environmental change.*

...

*What our study suggests is that firms need a map in which they have confidence, before they undertake a major journey.*

Barr and Hough (1997)

This work effectively makes the argument that, in addition to engaging in a process of environmental scanning or sensing, organisations need to be able to codify and communicate information so that they can engage in well-informed, rational and consensual decision making.



A clear and rational organisation of environmental information is important, since it enables effective navigation to salient features in the data. However, perhaps more important, the codification of information can make explicit the cause-and-effect relationships that lead from the global business environment, through implications for industries and markets to end results for specific businesses. It is this chain of logic which is the crux of environmental scanning, and which so often proves difficult for analysts (see the quotation from Tovstiga and Aylward on page 1).

### **3.3 Visual argumentation as an appropriate tool in this domain**

*Visual Argumentation is a powerful and effective tool to support analysis, understanding, communication and reasoning from complex multi-dimensional data-sets and hence is appropriate in this problem domain.*

Previous sections have presented arguments for effective scanning of the business environment as a key component of strategy development. They have also shown that environmental scanning is frequently not done well. These arguments effectively define the ‘issue’ this thesis addresses.

The following sections move towards the solution domain for this issue. In particular, a theoretical underpinning for the application of visual argumentation is presented. Visual argumentation refers to graphical models with a more or less formal syntax and semantics that enable the expression and codification of complex arguments.

One of the most coherent and convincing arguments for the use of graphics over written language has been made by Tversky (2005):

*Graphics have an advantage over language in expressiveness; graphics use elements and relations in graphic space to convey elements and relations in real or metaphoric space. As such, they allow inference based on the visuospatial processing that people have become expert in*

*as part of their everyday interactions with space. As cognitive tools, graphics facilitate reasoning, both by externalising, thus by offloading memory and processing, and by mapping abstract reasoning into spatial comparisons and transformations. Graphics organise and schematize spatial and abstract information to highlight and focus the essential information. Like language, graphics serve to convey spatial and abstract concepts to others. They make private thoughts public to a community that can then use and revise those concepts collaboratively.*

Tversky (2005)

The following sections present arguments in support of this case, first from the basis of the underlying mechanisms of reasoning and memory (broadly the domain of cognitive psychology) and, second, through reference to various forms of visual argumentation and other graphic models that have been successfully applied elsewhere.

### **3.3.1 Evidence from cognitive psychology and education**

Any method that seeks to address the issues associated with business environmental analysis should take into account various aspects of human cognitive psychology. Thus, for a method to be effective, it can be presumed that it needs to encourage and support ‘remembering’ and ‘thinking’ (key elements of the general framework for cognitive activities identified by Craik and Lockhart (2008)). Thus:

- Remembering: To enable analysts to absorb and recall business environmental information quickly and efficiently in order to allow them to cognitively process larger datasets and to enable the intellectual use of that information after analysis; and
- Thinking: To be able to reason, logically and rationally across datasets to enable deep insights and useful deductions to be made.

With regards to remembering, a key feature of effective memory and subsequent recall is that learners need to engage in ‘deep cognitive processing’ (Craik and Tulving, 1975; Craik and Lockhart, 1975, 2008). This typically occurs when a learner transforms information from one form to another (for example from words into a picture) or when the learner consciously makes associations between items of information.

As can be seen from the introduction to PESTLEWeb in Section 2, the method requires the analyst to both transform information (from the linear text of source material into graphical elements) and to create multi-dimensional associations between items. It should be noted that, since PESTLEWeb has a pre-defined semiotic system and syntax, the degree of transformation is not as great as it might be with a completely unconstrained diagramming technique, such as a mindmap (Buzan, 1993). The rationale for the design decision of having a defined semiotic system in this case is to promote ease of learning, exchange of information and development of collaborative models.

In regard to thinking, Buckingham Shum *et al* (1997) have presented the case for graphical argumentation:

*... the intellectual demands of visualising the structure of an argument can provide insights into its strengths and weaknesses, thus facilitating its more rigorous construction. Furthermore, ... exposing an argument's structure in this way facilitates in subsequent communication because important relations can be more easily perceived and analyzed by others.*

Buckingham Shum *et al* (1997)

The differences between text-based, and graphical-based argumentation have been tested experimentally by Bauer and Johnson-Laird (1993). Their work tested the ability of subjects to perform more or less complex reasoning tasks based on information presented in text form or using a graphical 'model' of the argument. They report that subjects responded faster and drew many more valid conclusions from diagrams than from the verbal premises. Although the reasoning tasks presented in these experiments were of a rather specific kind (double disjunctions), they nevertheless add weight to the idea that arguments presented graphically can support reasoning and logical deduction.

However, it is not just the low-level aspect of cognition relating to complex deductions which is of relevance here. Rather it is the higher-level aspects associated with expert performance over that of the novice. After all, in the context of a business school or in professional practice, we are concerned not only with the minutia of correct, logical

deduction but rather with a holistic expertise in analysis and theory-building. As Glaser and Bassok (1989) have pointed out, in the context of reviewing key trends in instructional theory:

*Experts and novices may be equally competent at recalling specific items of information, but experts chunk these items in memory in cause and effect sequences that relate to the goals and subgoals of problem solution and use this information for further action. The progression from declarative knowledge to well-tuned functional knowledge is a significant dimension of developing competence.*

Glaser and Bassok (1989)

This has a notable resonance with the quotation from Aylward and Tovstiga above, although it is more general in scope. This paper contributes to the case that, in teaching analysis of the business environment, the emphasis must surely be on a progression from identification of facts (declarative knowledge) towards providing intellectual tools and experience in ‘chunking’ information into cause-and-effect sequences.

One of the authors of a key work on scanning the business environment, Schoemaker, has written on the subject of MBAs and business school education and calls for a new approach to business education (Schoemaker, 2008). Schoemaker calls for a greater focus on uncertainty and paradox and identifies ‘scanning the periphery’ as one of the five key challenges facing business leaders. He points out that companies can discover many opportunities by attending to and acting on weak signals in the periphery (the business environment). Schoemaker is generally critical of reductionist models having such prominence in business education. In this context, however, the PESTLEWeb method is intended to be ‘analytical’ whilst not being principally ‘reductionist’. A PESTLEWeb model is intended to embrace the complexity of the business environment with its many dimensional relationships, to make it explicit, to lay it bare and hence promote understanding and reasoning within the context of that complexity, not in denial of it.

In a later paper, Schoemaker and Day make an explicit link between scanning the business environment and common psychological predispositions towards error, including filtering, distorted inference and bolstering pre-formed ideas through selective search (Schoemaker and Day 2009). Both of these arguments (that well understood psychological mechanisms can lead to disastrous failures and that purely reductionist approaches to problem solving can fail to identify significant threats) have been presented by the author in previous works (Collins and Leathley, 1995; Collins and Thompson, 1997a, b).

Schoemaker and Day's proposal for dealing with psychological error is to employ a series of strategies aimed towards sense-making and include testing multiple hypotheses, canvassing the wisdom of the crowd and developing diverse scenarios. A PESTLEWeb model is intended to support these activities since, as argued above, it aims to capture some of the rich complexity of the business environment. A PESTLEWeb model is not principally reductionist, since it does not reduce observations of the environment into discrete atomic facts. Rather, it enables diversity in sense-making because its core component of discourse is a 'thread' or causatively related structure of potentially contradictory or uncertain elements.

As described in Section 3.1.2 above, the 'Congregate Cognitive Maps' described by Bougon (1992) provide an excellent model for the way in which PESTLEWeb models might be used in practice to 'canvas the wisdom of the crowd', i.e. for models to be constructed collaboratively by analysts and/or leadership teams and then exposed for wider review.

Of course, such 'crowds' need not be confined to a single firm. Considering the view of Astley described in Section 3.1.1 (that firms may operate in a co-evolutionary manner with their environments), PESTLEWeb models may provide a mechanism to both identify and work with exogenous partners.

### 3.3.2 Evidence based on other examples of visual argumentation

PESTLEWeb models are but one example of many semi-formal, graphical ‘tools for thinking’ that have been employed from disciplines including business and strategy, philosophy, law, government policy development, computer software development, capture of design rationale, analysis of systems safety and analysis of ‘soft’, often social, systems.

For example, the ‘SPIRE’ method (which shares a number of features in common with PESTLEWeb) has been described by Klein and Newman (1980). The SPIRE approach is described as a ‘Systematic Procedure for Identifying Relevant Environments’ (SPIRE). Whilst SPIRE ultimately results in a graphical representation of the relationships between issues that resembles PESTLEWeb models, it is not, at its core, a graphical method. Rather, issues in the environment are coded with their relationships into text, being formatted in a computer-readable form. These issues and relationships are intended to be generated by analysts or business leaders based on inspection of the firm and its environment. Computer software is then used to identify environmental issues that have common causes and consequences and to group these into clusters for graphical display.

The paper by Klein and Newman is motivated by similar concerns to this thesis and makes similar arguments in a number of regards. However, it does appear to place a greater emphasis on software for the identification of common groups rather than considering the construction of the graphical argument as part of the intellectual discovery process, as argued here. A final distinguishing feature of the SPIRE method is that the groups of issues are not ‘typed’ by categories such as “Political”, “Social” etc. Rather, the clusters are ‘grounded’ in an analysis of the problem domain. The analogue here is the Grounded Theory of Glaser and Strauss (1999), in which categories are obtained from the domain of study rather than imposed upon it.

Eden has been influential in the development and use of cognitive maps within organisations (Eden, 1989, 1992; Eden *et al*, 1992):

*Cognitive maps can be seen as a picture or visual aid in comprehending the mappers' understanding of particular, and selective, elements of the thoughts (rather than thinking) of an individual, group or organization. They may also be seen as a representation that is amenable to analysis by both the mapper and others.*

Eden (1992)

Cognitive maps share many similarities with PESTLEWeb models but are generally less constrained. That is, although they serve to map a series of 'ideas' or 'issues' and show linkages between concepts, those issues are not typically 'typed' (categorised). PESTLEWeb models might thus be considered as a domain-specific example of cognitive maps. The relationships encoded in cognitive maps have a variety of meanings and may be simply bi-relational, directed (uni-relational) or causative.

The notion of visual argumentation seems to have arisen first with the work of Steven Toulmin (Toulmin, 1958; Schmidt 1986). Toulmin proposed a system of six interrelated components which could be applied to the analysis of arguments. These ideas may be employed both to analyse arguments, to represent them and to construct them. An example of a legal argument constructed to the Toulmin model is shown in Figure 9.

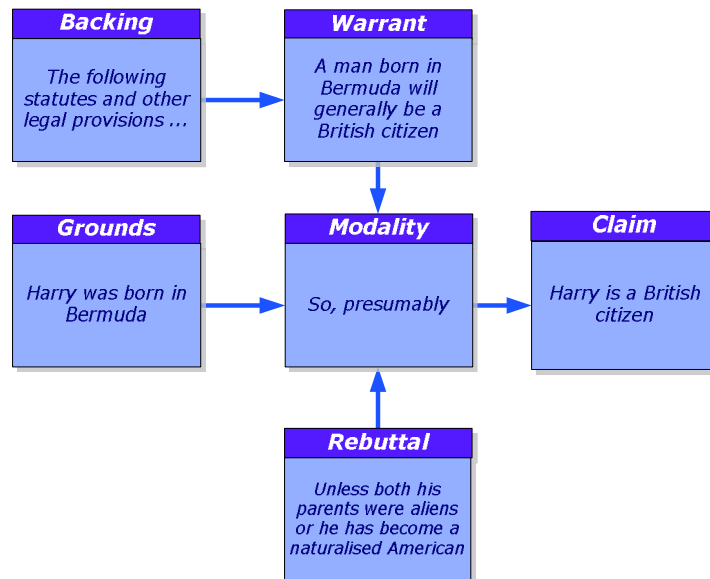


Figure 9: Example of Toulmin-Style Legal Argument, redrawn from <http://repgrid.com>

Notice that the Toulmin model is ‘typed’ by the various components of the argument (‘Claim’, ‘Modality’ etc.). This is similar to the PESTLEWeb model, but it is even more constrained since there is defined syntax of relationships between typed elements, e.g. a ‘Backing’ always applies to a ‘Warrant’ and is not syntactically correct in other positions.

The Toulmin model of argumentation raises another question in relation to PESTLEWeb: does PESTLEWeb in fact constitute a language for argumentation? PESTLEWeb provides a syntax for expressing ‘implication’/‘causation’, and for ‘relating’ issues. It does not, however, provide the equivalent rich syntax for the elements of argument that are present in the Toulmin model. The rationale for PESTLEWeb in its present form is that it is intended to be relatively easy to learn. Introduction of Toulmin-style structural elements might improve the richness and formality of the argument, but may also make the language more difficult to learn and use. This question is beyond the scope of the research presented in this thesis, which is limited to an investigation of the core PESTLEWeb method. However, it does provide an opportunity for further comparative research with more complex notations.

The use of graphical legal arguments in the Toulmin style to support jury decision making have been investigated experimentally by Tesařová (2007), with interesting results. Whilst mean performance levels did not vary between graphical and textual arguments, there was a statistically significant difference in the spread of performance. That is, there was a significant degree of individual difference. Some individuals did very much better using graphics opposed to text, whereas some did rather worse. The implication would be that providing a choice of medium for argumentation would be more appropriate than an absolute adoption of one or the other.

Within the domain of large-scale systems engineering, the author has developed a graphical notation intended to capture the rationale for complex design decisions – the Essential Logic Model (ELM) (Collins 1997a, b). Perhaps surprisingly, such decisions



share a number of features in common with an analysis of the business environment. In particular, items in the model may be:

1. Mutually contradictory;
2. Dynamic (subject to more or less rapid change); and/or
3. Uncertain.

Indeed, such features of the model and of the underlying reality it represents are a key motivator for constructing such a model; the model enables the complexity to be externalised and managed. PESTLEWeb adopts some of the notational conventions of the ELM in that the graphical elements representing relationships in the model distinguish between those that are purely relational and those that have a causative component.

In contrast to the previous diagrammatic models, Checkland's 'Soft System Methodology' introduces conceptual models of human activity systems (Checkland, 1993) that have a less formal syntax (see Figure 10). This example represents the flow of information or material, but Checkland uses essentially the same syntax and notational conventions to represent 'influence' between elements in the analysis and sometimes the sequencing of activities. This 'looseness' in syntax is in sharp contrast to the notations used by business analysts and computer scientists to represent technology systems (Hoare, 1985; Shlaer and Mellor, 1992; Selic *et al*, 1994; Friedenthal *et al* 2009).

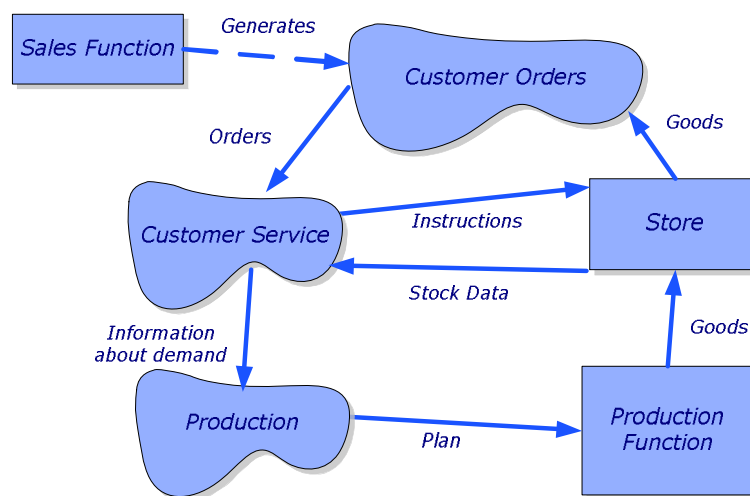


Figure 10: Conceptual Model of an Order-Processing System, Redrawn from Checkland 1993

PESTLEWeb sits somewhere between these extremes; elements of the model are ‘typed’, and there are different notational conventions for two distinct classes of relationship. However, no constraints are imposed on the order of elements and their relationships or their cardinality.

### **3.4 Conclusion**

This thesis addresses the question “Is there a better way to analyse the business environment?” This question arises from the dual observations that (1) modelling the business environment is an important prerequisite for strategy formation (Section 3.1.1) and (2) that the process is frequently flawed and often entirely absent (Section 3.2.1). This review provides some strong indicators of where such an improved method might be found. In particular, a case is made for the use of visual argumentation as a tool for conducting and representing analysis of the business environment (Section 3.3). This argument is based in the literature of cognitive psychology, business strategy, law and education, with reference to other disciplines that have effectively employed such techniques to address similar issues.

Having made a theoretical argument for the use of visual argumentation to analyse and represent the business environment, the remainder of this thesis seeks to investigate a specific example of a visual language designed specifically for that purpose, namely PESTLEWeb. The investigation is structured to reflect the literature that has been presented. Thus, aspects of the method in relation to cognition are first investigated, followed by a study that is more focused on the practical and pragmatic aspects of such a method; teaching, learning and application.

## 4 Investigation

### 4.1 Conceptual framework

A conceptual model for this investigation, as recommended by Hair *et al* (2007), is presented in Figure 11. This diagram identifies and categorises the key factors leading to effective analysis of the business environment, based on Section 3.

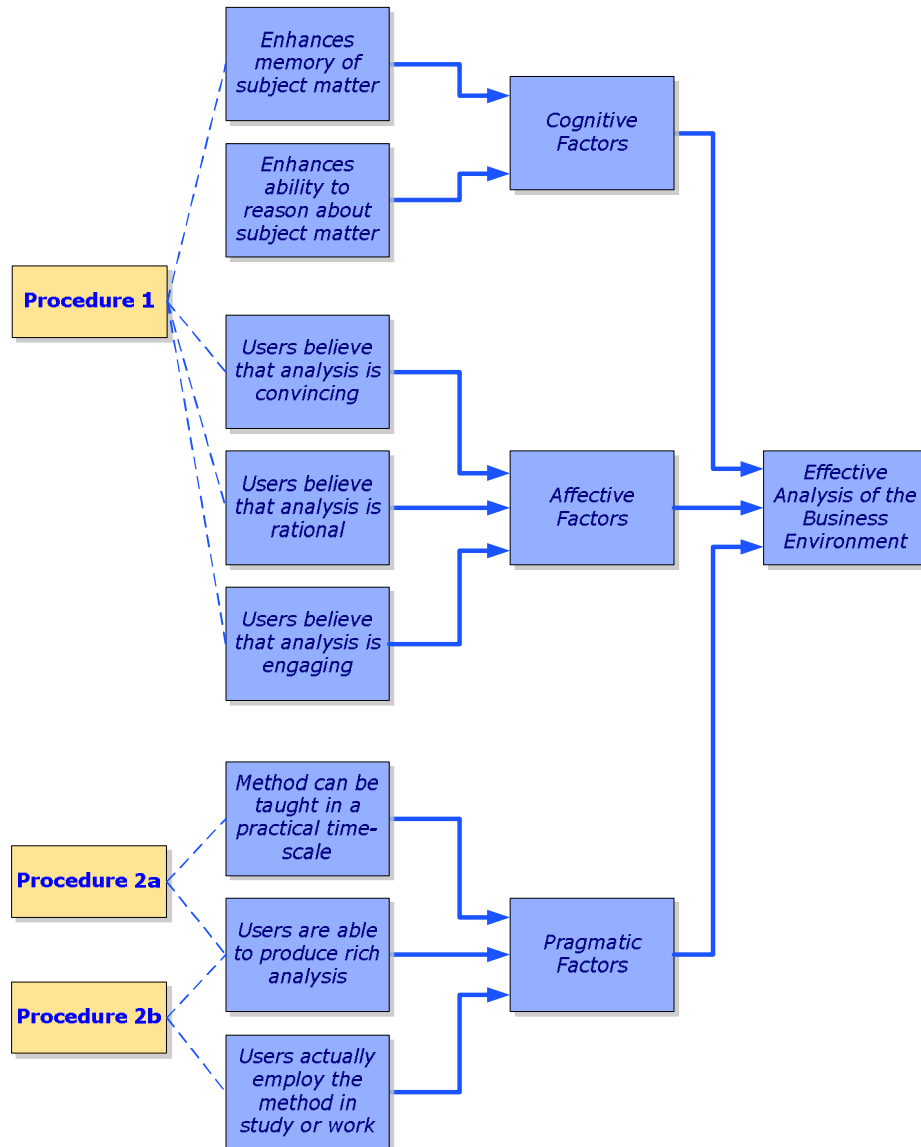


Figure 11: Conceptual Model of Factors Leading to Effective Analysis of the Business Environment

The structure of the investigation reflected the conceptual model and included:

1. An experimental procedure intended to rigorously test the hypothesis relating to the cognitive and affective properties of the method; and
2. An observational procedure to test the pragmatic application of the tool, conducted in two parts:
  - a. A workshop-based ‘observational’ procedure intended to test the method in a more realistic, practical setting.
  - b. A longer-term follow up to the workshop session to investigate adoption and use of the method by students.

To summarise the research design according to the categories of Hair *et al* (2007):

Procedure (1) was specifically a causal research design intended to test the cognitive and affective properties of the PESTLEWeb method in a rigorous, quantitative fashion. Procedure (2a) was a descriptive research design intended to develop frequencies of variables associated with learning. Procedure (2b) adopted an exploratory design which is essentially “discovery oriented”; Students were taught how to use the method and the results were observed.

Considering the ‘fixed’ vs. ‘flexible’ taxonomy of Robson (2002), Procedure (1) was a ‘Fixed Experimental’ design and Procedure (2a) was principally a ‘Fixed Non-experimental’ design. However, as is explained below, it also included elements of a flexible, ethnographic study. Procedure (2b) employed a flexible design of ‘non-structured’ observation.

Procedure 1 is documented separately from procedures 2(a) and 2(b) in the following sections. 2(a) and 2(b) are discussed together since they are essentially short-term, and long-term aspects of the same activity. A final section brings together the results in a final conclusion. Figure 11 indicates the relationship between the key factors driving effective analysis of the business environment and the elements of the study intended to shed light on those factors.

## **4.2 Ethical considerations**

It was recognised that both experimental and observational studies may raise ethical issues, such as that of the absence of consent for covert observation (Gray, 2005; Hair *et al* 2007). Consequently, a review of the designs for both procedures was conducted with regards to such issues. It was concluded that both procedures were free of such issues on the following grounds:

1. All participation was on the basis of informed consent.
2. Participants were all competent adults, free to opt out of the procedures at any time.
3. The designs were completely ‘open and honest’ – there was no covert observation and participants were clearly informed about the intention of the research and the extent of their involvement.
4. All results were made anonymous. Participants were given the option of joining a mailing list to receive the results of the research, but identities were not correlated with specific results from questionnaires or response papers.
5. In relation to responsibilities towards sponsors, staff of Henley Business School were completely cognisant of the intended procedure and there was judged to be negligible risk to the school’s reputation.

## **4.3 Procedure 1: An experimental investigation of cognitive and affective responses to PESTLEWeb models**

### **4.3.1 Objectives**

The primary objective of Procedure 1 is to test, under experimentally rigorous conditions, whether there are differences in cognitive and affective responses between PESTLEWeb models compared to purely textual descriptions of industry contexts. The procedure is intended to test if there are measurably different properties of subjects’ responses to the proposed graphical method compared with traditional text-based descriptions. Such a test is important because we would like to understand if the PESTLEWeb method has desirable properties that would indicate its efficacy in use. In particular, it is useful to understand its use in a business school teaching context.

Considering the alternate outcome, it should be noted that, if there were no measurable differences between the proposed graphical method and traditional text-based presentations, this would call into question the notion that there were any advantages in using the graphical method.

The hypotheses tested in this procedure fall into two categories:

1. The 'Cognitive': That is, is there a difference between the two forms of presentations in people's ability to remember the information?
2. The 'Affective': That is, people have different opinions about the two modes of presentation. Do they judge one to be 'better' than the other? In particular, do people regard one as being more persuasive, engaging (interesting) and rational than the other.

Two key hypotheses to be tested may thus be postulated:

H<sub>1</sub>: There is a significant difference in subject's ability to remember information relating to the business environment presented as a PESTLEWeb model, as compared with presentation in a text-only format

H<sub>2</sub>: There is a significant difference in subject's opinions about the suitability of presenting information relating to the business environment as a PESTLEWeb model, as compared with presentation in a text-only format

The corresponding null hypotheses are:

H<sub>10</sub>: There is no significant difference in subject's ability to remember information relating to the business environment presented as a PESTLEWeb model, as compared with presentation in a text-only format

H<sub>20</sub>: There is no significant difference in subject's opinions about the suitability of presenting information relating to the business environment as a PESTLEWeb model, as compared with presentation in a text-only format

A secondary objective of Procedure 1 is to investigate if various sub-groups (based on gender and educational background) demonstrate different responses to the

PESTLEWeb as opposed to a textual mode of presentation, as compared with the total population of participants.

### **4.3.2 Design**

The experiment was designed to replicate a traditional lecture in a highly controlled manner. That is, for information on a business environment to be presented using PowerPoint slides with a recorded, descriptive voice-over. The experimental set-up was similar in many regards to that employed by Tesařová (2007) to investigate the use of legal argumentation. However, difficulties associated with ensuring good control between runs for that procedure were overcome by the use of a recorded and strictly timed voice-over.

The hypotheses were tested in a classic, randomised, between-groups experimental design (Miller, 1986). The intention was to enable the results to be analysed using a student's t-test to determine if there were any statistically significant differences between the two experimental conditions (Rowntree, 1981).

Subjects were volunteers from two different intakes of postgraduate level business students studying for Masters of Business Administration (MBA) at a UK business school. Subjects were randomised between two experimental conditions by distributing randomised (shuffled) invitations to experimental sessions, hence mitigating against assignment bias. Subjects were provided with no prior information about the content or subject matter of the experimental sessions other than that they were to attend “an experiment in support of an MBA Management Challenge.”

Subjects were each given a response booklet comprising both categorisation questions (gender, educational background) and questions relating to the content of the procedure (see Appendix A). Subjects were given sufficient time to complete the initial classification before the procedure proper was started. Subjects were asked to provide responses on a ten-point Likert-type, interval scale (Hair *et al*, 2007).

Groups were assigned to two different experimental conditions. Both were presented with an identical, pre-recorded 'voice-over'. The majority of slides were identical, but the key 'information' slide differed in each case. In the first condition, the information was presented as PESTLEWeb model (see Figure 13 ). In the second case, the information was presented in text form (see Figure 12).

The technique of using a completely automated presentation resulted in a high degree of control between the two experimental conditions. Thus:

1. All spoken description was identical between the two conditions;
2. The timing of information presentation was automated, and identical between the two presentations; and
3. All hesitations, errors of speech and mispronunciation were edited out of the pre-recorded audio.

The content of the text in condition (2) was closely based on the PESTLEWeb model in condition (1).

The response questionnaire was divided into two primary sections:

1. Questions intended to test  $H_1$  (five questions); and
2. Questions intended to test  $H_2$  (three questions).

A final question was related to  $H_1$  and required the subject to replicate as much of the respective information slide as possible. This was intended to discover if subjects could replicate the general form of the argument, whilst not depending on any specific content.

Questions in group 1 (testing  $H_1$ ) consisted of required recall of the content of the information slides with a range of cognitive difficulties, i.e. varying from those that required simple recall of the contents of one item to those that depended on both recall of facts and the relationship between elements.



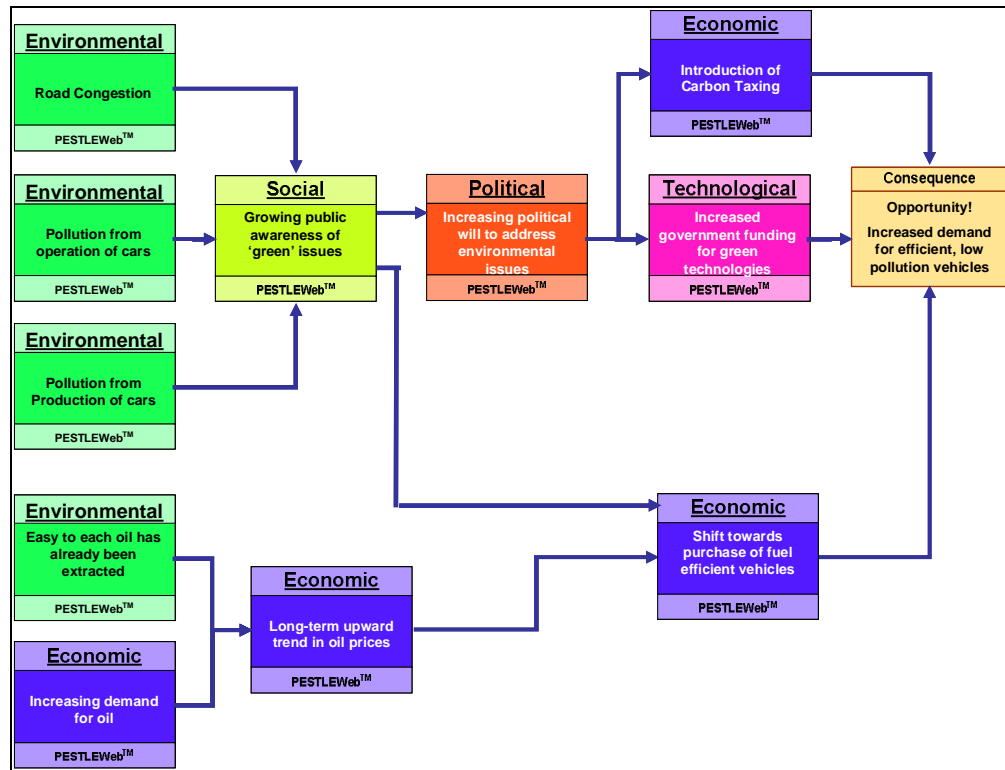


Figure 12: PESTLEWeb Version of the Business Environment Information

1. There is increasing political will to address environmental issues
2. This political issue is a consequence of the growing social issue of public awareness of 'green' issues
3. The issue of growing public awareness of 'green' issues, in turn arises from the environmental issues of road congestion, pollution from operation and pollution from production of cars
4. The consequences of increasing political will to address environmental issues is the introduction of carbon taxing (an economic issue) and increased government funding for green technologies (a technological issue)
5. The issue of increased public awareness of 'green' issues also leads to the consequence of an economic shift towards purchase of low-emission vehicles
6. This shift is, a consequence of the economic long-term upward trend in oil prices
7. The upward trend in oil prices is a consequence of both the economic issue of increasing demand for oil and the environmental issue that the 'easy to reach' oil has already been extracted
8. The consequence of the introduction of carbon taxing, increased government funding for green technologies and the shift towards purchase of fuel efficient vehicles creates the opportunity of Increased demand for efficient, low pollution vehicles

Figure 13: Text Version of the Business Environmental Information

### 4.3.3 Pilot study for Procedure 1

The principle aims of the pilot study were to:

1. Ensure that the ‘technology’ for the experiment (the automated presentation) functioned correctly and was presented at a practical speed; and
2. The response paper (Appendix A) was clear and unambiguous.

The pilot was conducted first informally with group of four adults who had little or no experience with PEST analysis. A second pilot of the presentation and questionnaire was conducted with the author’s MBA study team; a group of five adults with significant familiarity with PEST analysis.

In both cases, the technology of the experiment worked well and there were no issues in terms of comprehending the questionnaire.

### 4.3.4 Findings and analysis

#### 4.3.4.1 Description of subjects

A total of 47 subjects took part in the experiment (n=47), broken down as shown in Table 1.

	<i>Condition</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
<i>Group 1</i>	PESTLEWeb	14	6	20
<i>Group 2</i>	Textual	21	6	27
				47

**Table 1: Constitution of Subjects**

<i>Educational Focus</i>	<i>Number</i>
Business	15
Engineering	8
Engineering, Science	4
Science, Business	4
Science	3
Business, Engineering	2
Social Sciences, Business	2
Business, Arts	1
Business, Law	1
Social Sciences	1
Law	1
Law, Arts	1
Law, Business	1
Law, Social Sciences, Arts, Business	1
Science, Business, Engineering	1
Science, Social Science	1
	47

**Table 2: Subject's Responses to Categorisation Question on Previous 'Educational Focus'**

#### **4.3.4.2 Differences between the two groups: Results of Testing $H_{10}$ and $H_{20}$**

An analysis of the responses of the two groups is presented in Table 3. In this table, groups have been compared using a 2-sample t-test. Results significant at the 5% level are highlighted in red.

It can be seen that for the 'Cognitive' (memory) group, whilst there is some difference between the two groups, this is not statistically significant in most regards. Only Q2 shows a p value less than 5% (3.76%). Thus, these results do not provide sufficient evidence to reject the null hypothesis  $H_{10}$ . This result holds true for each item treated

individually, as well as for the set of items Q1 to Q5 being treated together ('Sum Cognitive').

The results from the 'Affective' group, however, show a strongly statistically significant result. Each of the items Q6 to Q8 shows a significant difference well below the 1% level. Thus, there is sufficient evidence here to reject the null hypothesis  $H_{20}$ .

Item	Cognitive					Affective			Sum all	Sum Cognitive	Sum Affective
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8			
Group 2 Mean	3.00	1.74	2.22	2.04	1.89	4.85	3.26	6.33	25.3	10.9	14.4
Group 2 SD	1.24	0.90	1.50	0.76	1.22	2.63	2.18	2.25	12.7	5.6	7.1
Group 1 Mean	3.15	2.55	2.95	2.05	2.15	6.80	6.95	8.35	35.0	12.9	22.1
Group 1 SD	1.35	1.47	1.76	1.28	1.27	1.96	1.50	1.46	12.0	7.1	4.9
Difference between SDs	-0.11	-0.57	-0.26	-0.52	-0.05	0.66	0.67	0.79	0.6	-1.5	2.1
Mean Difference	0.15	0.81	0.73	0.01	0.26	1.95	3.69	2.02	9.6	2.0	7.7
Std Error Difference	0.38	0.37	0.49	0.32	0.37	0.67	0.54	0.54	3.6	1.9	1.7
df	39.06	29.44	37.11	28.80	40.17	44.99	44.83	44.34	42.2	35.1	44.9
t-statistic	0.39	2.18	1.49	0.04	0.71	2.91	6.87	3.71	2.6	1.0	4.4
p-value (2-sided, $H_a: \mu_1 \neq \mu_2$ )	0.70	0.0376	0.14	0.97	0.48	0.0057	0.0000	0.0006	0.0114	0.3154	0.0001
p-value (1-sided, $H_a: \mu_1 < \mu_2$ )	0.65	0.9812	0.93	0.52	0.76	0.9972	1.0000	0.9997	0.9943	0.8423	1.0000
p-value (1-sided, $H_a: \mu_1 > \mu_2$ )	0.35	0.0188	0.07	0.48	0.24	0.0028	0.0000	0.0003	0.0057	0.1577	0.0000

**Table 3: Results of 2 Sample t-test for Procedure 1, Comparison of PESTLEWeb vs. Text Presentation (Results significant at the 5% level highlighted in red)**

In summary, the evidence suggests that, whilst the PESTLEWeb diagram did not enhance memory and recall of information relating to the business environment, subjects nevertheless found it more persuasive, engaging (interesting) and rational.

**4.3.4.3 Are the ‘cognitive’ and ‘affective’ categories reliable?**

The complete set of subject responses was tested for internal consistency using Cronbach's alpha measure. The results are shown in Table 4. Given the familiar criteria of reliability of a Cronbach’s Alpha score greater than 0.7, it can be seen that only the ‘Affective’ group of items are internally consistent.

<i>Question set</i>	<i>Cronbach’s Alpha</i>
All questions	0.64
Cognitive group	0.33
Affective group	0.78

**Table 4: Cronbach's Alpha for Results of Procedure 1**

It is thus reasonable to conclude that the ‘Affective’ measures in this experiment are internally consistent, whereas the ‘Cognitive’ measures are not. Subjects tend to have a consistent (positive) view about the persuasiveness, interest and rationality of the PESTLEWeb model as compared with text presentation. However, Q1 to Q5 do not consistently measure participants’ ability to remember information from one type of presentation compared to the other.

**4.3.4.4 Exploration of further hypothesis: Gender and educational background**

No significant statistical difference was found between sub-groups of participants. That is, there were no statistically significant differences based on either gender or educational background.

**4.3.4.5 Discussion of results and analysis of Procedure 1**

This section focuses on a detailed discussion of the experimental results and their interpretation rather than a more general discussion of the implication of these results for business education and practice. This latter subject is covered in sections 4.5 and 5 .

The most important finding from this procedure is that subjects did indeed see a PESTLEWeb model as being more persuasive, engaging (interesting) and rational than a textual mode of presentation. These subjects were drawn from a group considered to be representative of the intended users of a PESTLEWeb model; adults with significant management experience and a postgraduate level of knowledge and skill in business. This result suggests that PESTLEWeb would be a valuable tool when attempting to present an analysis of the business environment to such an audience.

It should be emphasised that there was a strongly statistically significant difference between the two groups. For all of the affective variables, there was less than 1% probability that this results could have been obtained by chance alone. For Q7, it was less than a 1 in 1,000 chance that such a result was as a result of chance.

Of course, this is not to say that these results could be generalised without care. This was a self-selecting group drawn from one business school class and could therefore be biased in a number of respects. However, for this group the result was statistically significant and this at least provides a positive indicator for a more general difference.

The second result is perhaps counter-intuitive, but is consistent with previous research findings. Subjects did not find the pictorial PESTLEWeb model any more or less easy to remember than a text presentation. This result is consistent with the work of Craik and Lockhart (1975, 2008), who argued that it is depth of cognitive processing that leads to enhanced memory rather than mode of presentation *per se*. This suggests an opportunity for further investigations in which memory effects are tested not for presentation of PESTLEWeb models, but for their production. That is, to test if subjects are better able to remember such analysis if they are actively involved in the production of the PESTLEWeb model.

It should perhaps be considered if these two are results inconsistent. Are subject's (affective) judgments about the method consistent with their performance in purely cognitive (memory) terms? The argument is that these results are not inconsistent. That a person is persuaded by an argument is not necessarily contingent on them being able to remember the details of that argument. It only depends on their judgment that they were persuaded by the argument as it was presented. The same is true of an argument's

'logicality' and 'rationality'. Moreover, the memory test is a rather 'low-level' test of subject's ability to recall content, whereas the affective measures are indicative of a higher-level intellectual process representing a change in mental state.

Without descending into abstract philosophy, a final point should be appreciated; subjects were not tested on the extent to which they were actually persuaded by the argument, but rather they were asked their opinion on the persuasiveness of the presentation. These are subtly but crucially different things. Indeed, one could design an experimental procedure that directly addresses the question of the extent to which subjects were persuaded by the argument. Thus, subjects might be asked: "To what extent do you agree with the conclusion that there is an opportunity for fuel-efficient vehicles" rather than a question such as "Do you think the presentation was persuasive?" This suggestion provides another opportunity for further research in this domain.

Considering the test of sub-groups of subjects, there were probably too few individuals in each sub-group to determine a statistically significant difference even if such a difference had indeed been present. It is thus suggested that further runs of Procedure 1 be conducted in order to increase the sub-group size. It would be valuable to know if there was a difference in performance between textual and visual argumentation of this type between sub-groups based on gender, language, educational background and stated preference in 'learning styles'. Such information would enable learners and analysts alike to select a method of presentation more appropriately for a given audience.

#### ***4.4 Procedure 2: Workshop-based observation and longer-term follow up***

##### **4.4.1 Objectives**

This study was designed to determine whether PESTLEWeb could be used productively within an educational setting. That is, rather than just being a 'theoretical' tool of 'academic' interest, could it actually be used to enhance student learning and analysis of the business environment? A further objective was to determine if there was any application of learning subsequent to the initial learning activity.



The questions to be addressed in this observational study were:

Would students

1. Be interested in the method?
2. Be able to understand the method in the time-frame of a one-hour tutorial workshop?
3. Engage with the method to the extent that they could apply it to a short case study?
4. In the longer term (post workshop), adopt the method productively in their MBA assignments and/or workplace?

Additionally, through the use of 'pre-' and 'post-' workshop questionnaires, there was an objective to gather information relating to:

1. Their company's current ability to scan the business environment;
2. Their use and opinions of other, traditional methods of analysing the business environment;
3. Their opinions about the PESTLEWeb method as presented in the workshop; and
4. Their views on the likelihood of their future use of the method.

As recognised above, information gathered in an observational study is invariably less definitive than that gathered through experimentation. However, the questions addressed in Procedure 2 strive to get to the crux of the matter: Is PESTLEWeb suitable for use by MBA students? Can it be taught in a sufficiently short timescale? Can students understand it? Can they use it? Will they use it? Do they believe it helps them perform 'deeper' and 'richer' analysis? Having gained a working knowledge of the method, will they choose to apply it in practice?

It is these latter questions on which the adoption and use of the PESTLEWeb method rests.

## **4.4.2 Design**

### **4.4.2.1 Method of evaluation**

The design intent of this procedure was to replicate, as far as possible, a realistic teaching session within an MBA context and then to monitor the longer-term outcomes

of the training. This is appropriate since it is exactly this context in which the PESTLEWeb method is intended to be applied in the first instance.

A common model for evaluating learning of this type is the Kirkpatrick Levels of Training Evaluation, as outlined in Table 5 (Kirkpatrick and Kirkpatrick, 2009).

<b><i>Level 1: Reaction</i></b>	To what degree participants react favourably to the learning event
<b><i>Level 2: Learning</i></b>	To what degree participants acquire the intended knowledge, skills and attitude based on their participation in the learning event
<b><i>Level 3: Behaviour</i></b>	To what degree participants apply what they learned during training when they are back on the job
<b><i>Level 4: Results</i></b>	To what degree targeted outcomes occur as a result of the learning event and subsequent reinforcement

**Table 5: Kirkpatrick Levels of Training Evaluation**

The procedure described in this section was focused on levels 1 to 3 of the Kirkpatrick model. Levels 1 and 2 were evaluated observationally during the workshop session. Level 3 was evaluated through a longer-term follow up with students.

A design decision was made to avoid the use of traditional ‘happy sheets’ measuring the Level 1 (Reaction) responses of participants. This decision was made for several reasons:

1. Given the skewed, self-selecting nature of the group and the ambiguous nature of the presenter being a fellow student, it was considered unlikely that the results would be free of compliance effects.
2. Level 1 reactions were available observationally in the behaviour of the subjects (e.g. level of engagement and activity).
3. The developers of the Kirkpatrick model themselves argue that, in studies of the value of training, there is often an unfortunate bias towards Level 1 measures, where in fact it is levels 2, 3 and 4 that provide the most valuable

indicators of training value (Kirkpatrick and Kirkpatrick, 2009; Kirkpatrick and Kirkpatrick, 2010).

#### **4.4.2.2 Workshop design**

The workshop involved the presentation of the slides included as Appendix E. At slide 14, subjects were asked to trial the PESTLEWeb method as part of a structured activity. Subjects were given a short case study which they were asked to analyse using the PESTLEWeb method. Specifically, they were asked to identify 'PESTLE' issues through silent brain-storming, copy these issues to post-it notes and then arrange these into a PESTLEWeb model on a white-board. Subjects were then asked to critically review their results to consider dynamics and additional causes and consequences in their model.

The observational procedure used in this part of the study cannot be easily categorised using the familiar classes of qualitative research. However, it has elements that are familiar from ethnography (Hair *et al*, 2007), focus groups and action research (Eriksson and Kovalainen, 2008). Note that there was no intention for the observer to judge the 'quality' of the analysis produced by subjects. It was felt that this was not compatible with the type of activity taking place in the workshop, which was principally pedagogic. Rather, the intention was for subjects to judge the usefulness of the method and their ease of learning it.

As well as observations conducted during the session, a significant part of the data gathering for this investigation was achieved through 'pre-' and 'post-' workshop questionnaires. These provided the participants the opportunity to provide feedback on the workshop and to address specific questions relating to the study objectives.

It was recognised at the outset that the likely number of subjects for this study would be insufficiently large to draw significant, generalisable conclusions. Additionally, subjects represented a skewed population since they were self selecting. Thus, it was recognised that any results would be 'indicative' rather than 'conclusive'.

#### **4.4.2.3 Design of the pre- and post-workshop questionnaire**

The intention for both pre- and post-workshop questionnaires was not to test specific hypotheses, but rather to gather descriptive statistics concerning the responses. The intention was to shed light on the learning experience itself and the pre-workshop context for that learning.

The pre-workshop questionnaire was designed to provide a 'baseline' of subjects' current attitudes and use of business environmental scanning methods as taught on their MBA course. The core intent here was to discover if there was a need for an improved method in the minds of the participants.

Subjects were asked to respond on a five-point, Likert-type interval scale (Hair *et al*, 2007). The intention was to report findings using straightforward descriptive statistics (mean, standard deviation etc.) in both numerical and graphical form. A five-point scale was selected following the recommendation of Cox (1980). It was noted that there has been some criticism of odd-number Likert scales including a neutral mid-point, but that the literature is generally equivocal on this matter (Garland, 1991). Note however the comments on this subject in Section 4.4.4.6.

Question 1 focused on the subject's current business and their systems for scanning the business environment. This question was driven by Day and Schoemaker (2006), who identified that there is a common business issue associated with a failure to scan the business environment. Thus, even if subjects had not identified an issue in their current skills and behaviours in scanning the business environment, a lack of a formal system within their business would signal a latent need.

Questions 2, 3 and 4 were intended to probe the subject's pre-workshop use of the methods for scanning the business environment as taught on their existing MBA course. In particular, they focused on analysis for assignments, exam case studies and the context of their business.

Question 5 was not intended to elicit information about the subject's analysis of the business environment, but rather their views on the ease with which the results of that analysis can be communicated with others.

The post-workshop questionnaire was designed to provide information focused at level 2 (Learning) and level 3 (Behaviour) in the Kirkpatrick model. As a set, the post-workshop questions are intended to probe a single construct in the minds of the participants: is the PESTLEWeb method ‘better’ than the methods than subjects have previously been taught? That is, do participants believe:

1. It is relatively easy to learn? (Q1)
2. It provides better explanations than other methods they have experienced? (Q2)
3. Using it would improve their analysis? (Q3)
4. That they in fact intend to use it for MBA assignments? (Q4)
5. That they would like to learn more about the method? (Q5)
6. That they would like to collaborate in the use of the method? (Q6 and Q7); and
7. That the method would be useful for their business? (Q8)

#### **4.4.2.4 Investigating Kirkpatrick Level 3 results for the workshop**

Given the Kirkpatrick model, it was considered important to determine if there was any evidence of longer-term transfer of learning from the workshop into study or professional practice. Thus, subsequent to the workshop, attendees were given the opportunity to join a Community of Practise (CoP) for PESTLEWeb and to share the results of their analysis (Wenger and Snyder, 2000). The decision to create a CoP arose directly from the author’s engagement in the Knowledge Management module of the Henley MBA. People who joined the workshop were subsequently requested to share their own PESTLEWeb analysis and asked to comment on their own use of the method.

#### **4.4.2.5 Observational method**

Two approaches were adopted for observation. Firstly, the author acting as workshop leader noted behaviour during the workshop and subsequently recorded this in a journal. Since it was recognised that there was a difficulty associated with both leading a workshop and making detailed observational notes, a second observer (a member of the author’s MBA study team) also attended and observed the workshop. Information from the second observer was collated in a post-workshop debrief.

### **4.4.3 Pilot study**

A pilot workshop was held with the author's MBA study team. This involved an informal presentation of the workshop slides (Appendix E) and the completion of the pre- and post-workshop questionnaires (Appendix B).

Whilst the pilot group were already familiar with the PESTLEWeb method, they had not previously seen the workshop slides, nor had they seen the case study that was to be used within the workshop.

Some concern was expressed that the case study was "too easy" in that it made the various PESTLE issues very explicit in the text. This, however, was tempered by the view that the workshop group would be unfamiliar with the PESTLEWeb method and that there was a need to make the information relatively easy to analyse in a short workshop session.

One significant error was found in the pre- and post-workshop questionnaires; the rating scale was ranked from "Strongly disagree" to "Strongly disagree". This was, of course, subsequently corrected.

### **4.4.4 Findings and analysis**

Results for pre- and post-workshop questionnaires are presented in sections 4.4.4.1 and 4.4.4.3. As well as providing a histogram of results for each question, summary statistics are also provided. In this case, each of the available response options has been mapped onto a numerical value ('Strong disagree' = 1 ... 'Strong Agree' = 5) to obtain measures of mean, standard deviation, kurtosis and skewness.

#### **4.4.4.1 Observational results for the workshop**

It was apparent at the outset of the workshop session that participants were fatigued after a full day of workshop presentations and activities. Nevertheless, 20 attendees elected to remain after their study day and begin a second, hour-long workshop at 17:30.

Workshop attendees were attentive during the presentation but asked only two questions, as follows:

- Q. "Would you include the PESTLEWeb pictures in you MBA assignments, or just use a text version of the results?"

A. "I included the diagrams in my IMP assignment, followed by a section of text that identified the main threads of the argument and key results"

Q. "Which tool did you use to draw the PESTLEWeb diagrams?"

A. "I have used both Microsoft PowerPoint and Visio. I have produced templates for both of these tools and I will show you later how to access those"

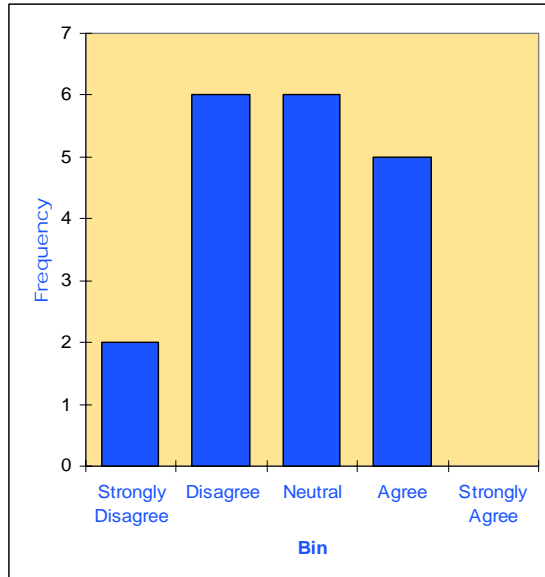
Workshop attendees appeared to start the activity at slide 14 rather hesitantly. From the observer's point of view, this appeared to be due to lack of energy after a full day of study rather than any serious confusion about the method. In particular, attendees appeared reluctant to move from the stage of identifying an initial list of issues towards organising them as a graphic model. This is obviously a key step which differentiates the PESTLEWeb model from traditional PESTLE analysis. The workshop presenter (the author) moved from group to group, encouraging them to start arranging the issues they identified into PESTLEWeb models on the flip-charts provided.

Over a period of some minutes, each of the groups did indeed begin to structure their issues into coherent models with, as might be expected, more or less success. The workshop presenter moved from group to group and challenged them to review their models and look for further potential causes and consequences in order to enrich their models.

After 15 minutes, the workshop leader called a halt to the activity and presented the remainder of the slides. Attendees were referred to a website containing supporting information for the presentation. They were finally requested to complete questionnaires and hand them in as the session ended.

#### 4.4.4.2 Results of pre-workshop questionnaire

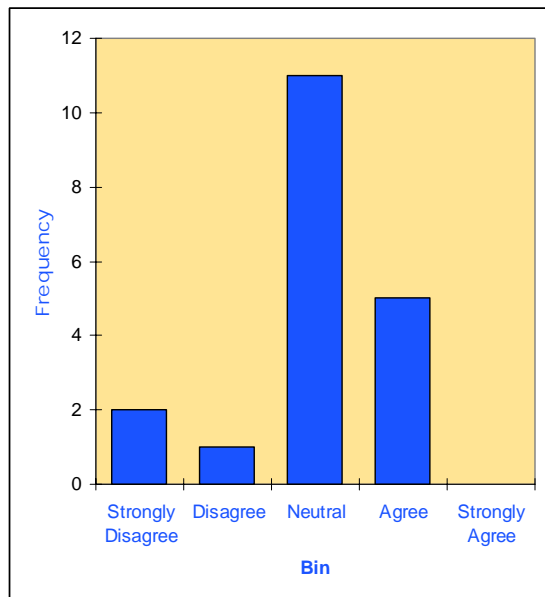
Question 1) My company has a well-developed system in place for scanning the business environment



<b>Question 1</b>	
Mean	2.74
Standard Error	0.23
Median	3.00
Mode	3.00
Standard Deviation	0.99
Sample Variance	0.98
Kurtosis	-0.94
Skewness	-0.17
Range	3
Minimum	1
Maximum	4

**Figure 14: Companies Have a System in Place for Scanning the Business Environment**

Question 2) I have found it easy to analyse the business environment as part of my MBA assignments

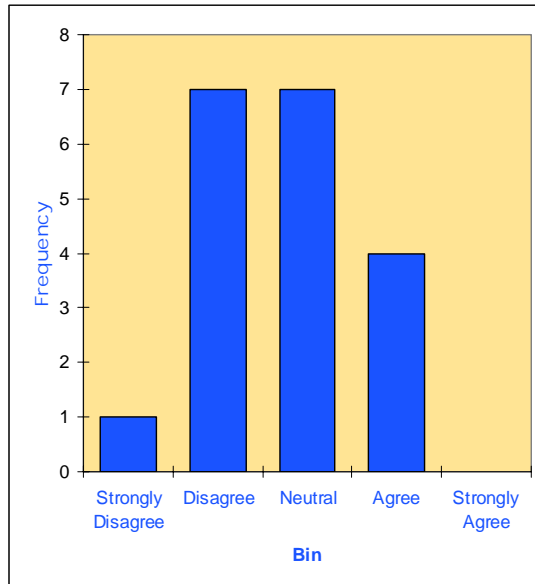


<b>Question 2</b>	
Mean	3.00
Standard Error	0.20
Median	3.00
Mode	3.00
Standard Deviation	0.88
Sample Variance	0.78
Kurtosis	1.30
Skewness	-1.09
Range	3
Minimum	1
Maximum	4

**Figure 15: Business Environmental Analysis for Previous MBA Assignments**



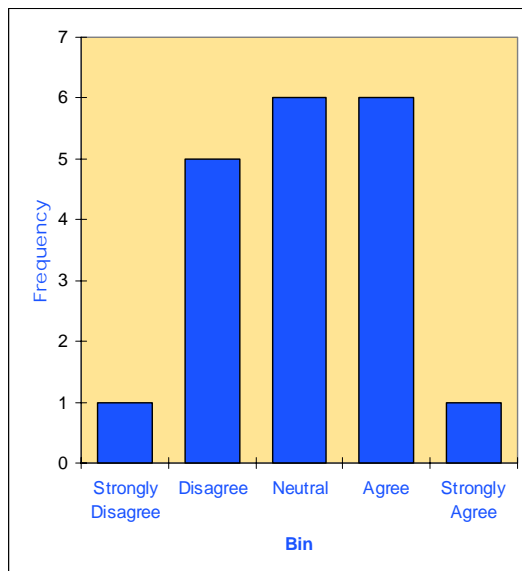
Question 3) I have found it easy to analyse the business environment for my MBA exam case studies



<b>Question 3</b>	
Mean	2.74
Standard Error	0.20
Median	3.00
Mode	3.00
Standard Deviation	0.87
Sample Variance	0.76
Kurtosis	-0.70
Skewness	0.01
Range	3
Minimum	1
Maximum	4

Figure 16: Subjects' Ease of Analysing Business Environment for MBA Exams

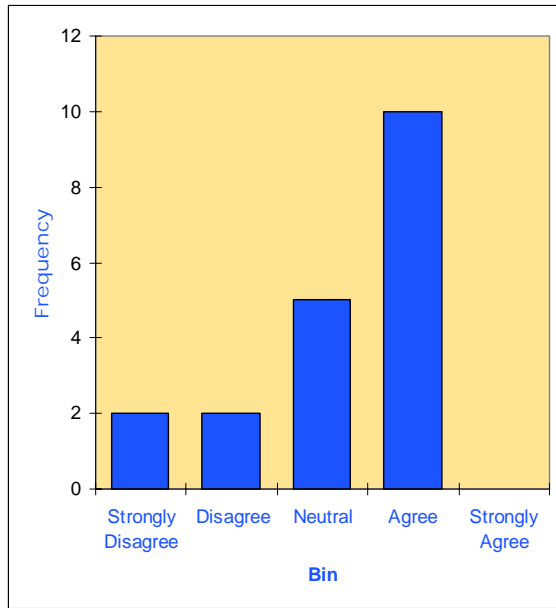
Question 4) I think that PESTLE analysis gives me deep insights into the context for my business



<b>Question 4</b>	
Mean	3.05
Standard Error	0.24
Median	3.00
Mode	3.00
Standard Deviation	1.03
Sample Variance	1.05
Kurtosis	-0.55
Skewness	-0.11
Range	4
Minimum	1
Maximum	5

Figure 17: Traditional PESTLE Analysis Provides Deep Insights

Question 5) I find it easy to explain the context of my business to others

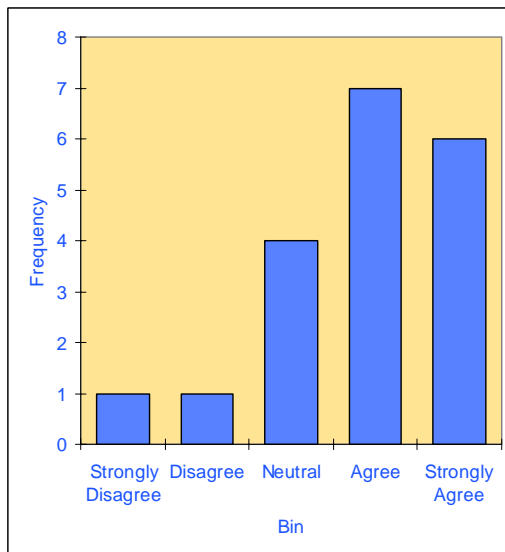


<b>Question 5</b>	
Mean	3.21
Standard Error	0.24
Median	4.00
Mode	4.00
Standard Deviation	1.03
Sample Variance	1.06
Kurtosis	0.26
Skewness	-1.15
Range	3
Minimum	1
Maximum	4

Figure 18: Subjects' Ease of Explaining the Context of their Business to Others

#### 4.4.4.3 Results of post-workshop questionnaire

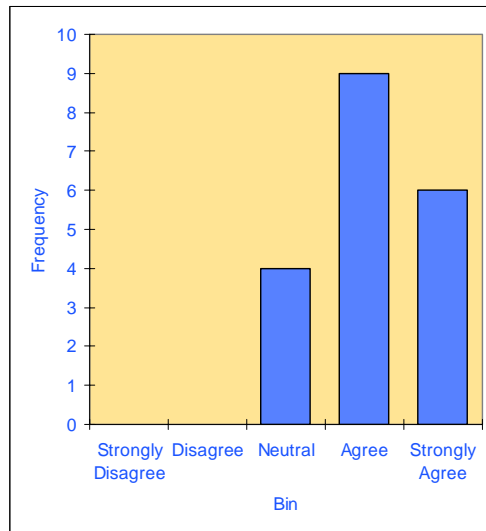
Question 1) I found the PESTLEWeb method straightforward to understand



<b>Question 1</b>	
Mean	3.84
Standard Error	0.26
Median	4.00
Mode	4.00
Standard Deviation	1.12
Sample Variance	1.25
Kurtosis	0.86
Skewness	-0.99
Range	4
Minimum	1
Maximum	5

Figure 19: Subjects' Ease of Understanding the PESTLEWeb Method

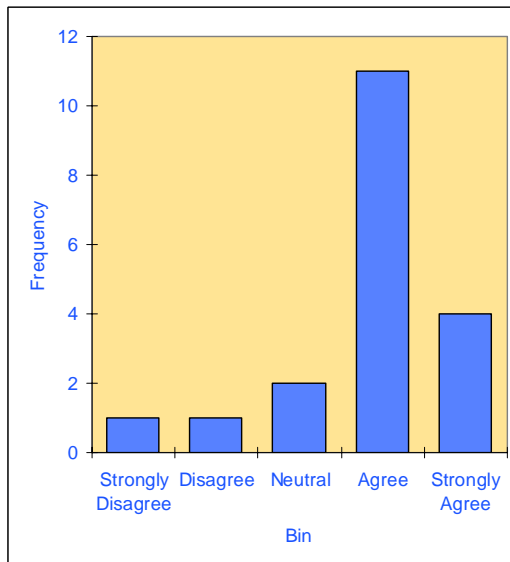
Question 2) A PESTLEWeb model provides a better explanation of the business environment than traditional PESTLE



<b>Question 2</b>	
Mean	4.11
Standard Error	0.17
Median	4.00
Mode	4.00
Standard Deviation	0.74
Sample Variance	0.54
Kurtosis	-1.00
Skewness	-0.17
Range	2
Minimum	3
Maximum	5

Figure 20: PESTLEWeb Provides a Better Explanation than Traditional PESTLE Analysis

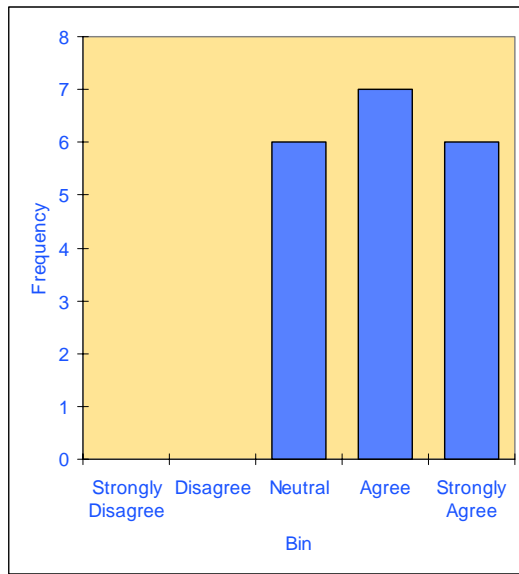
Question 3) Using PESTLEWeb would improve the quality of my analysis of the business environment



<b>Question 3</b>	
Mean	3.84
Standard Error	0.23
Median	4.00
Mode	4.00
Standard Deviation	1.01
Sample Variance	1.03
Kurtosis	2.65
Skewness	-1.44
Range	4
Minimum	1
Maximum	5

Figure 21: Subjects' Belief that use of PESTLEWeb Would Improve the Quality of their Analysis

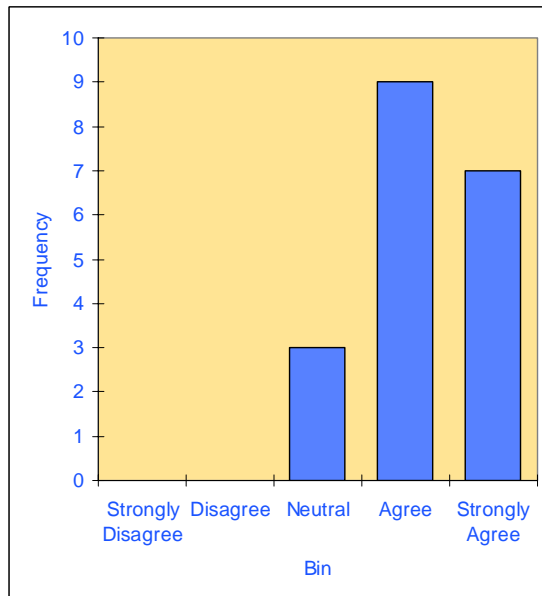
Question 4) I will use the PESTLEWeb method for my future MBA assignments



<b>Question 4</b>	
Mean	4.00
Standard Error	0.19
Median	4.00
Mode	4.00
Standard Deviation	0.82
Sample Variance	0.67
Kurtosis	-1.48
Skewness	0.00
Range	2
Minimum	3
Maximum	5

**Figure 22: Subjects' Intention to Adopt the PESTLEWeb Method**

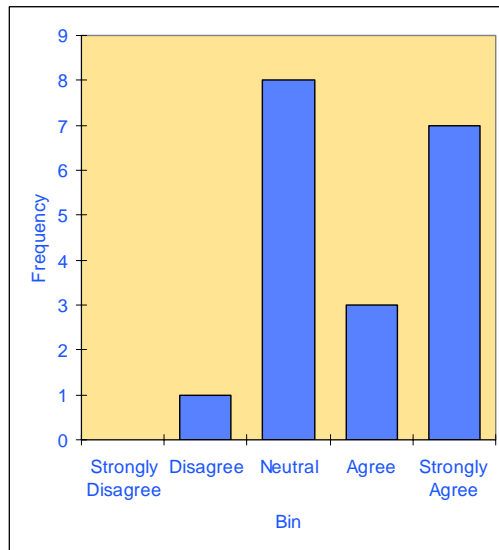
Question 5) I would like to learn more about the PESTLEWeb method



<b>Question 5</b>	
Mean	4.21
Standard Error	0.16
Median	4.00
Mode	4.00
Standard Deviation	0.71
Sample Variance	0.51
Kurtosis	-0.82
Skewness	-0.34
Range	2
Minimum	3
Maximum	5

**Figure 23: Subjects' Enthusiasm to Learn More about the PESTLEWeb Method**

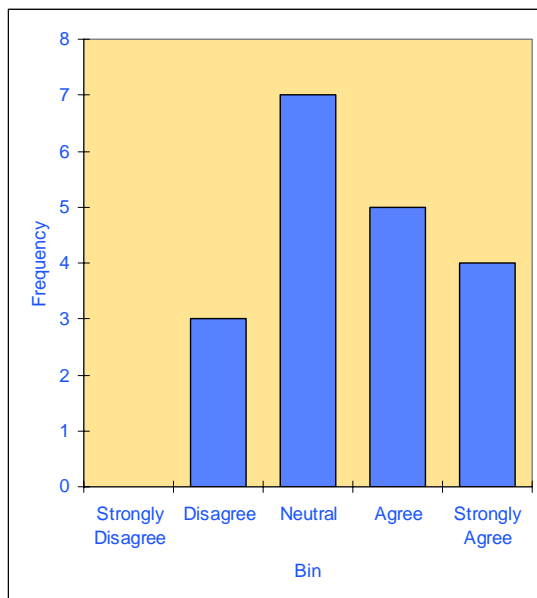
Question 6) I would like to see PESTLEWeb models for my industry produced by others



<b>Question 6</b>	
Mean	3.84
Standard Error	0.23
Median	4.00
Mode	3.00
Standard Deviation	1.01
Sample Variance	1.03
Kurtosis	-1.51
Skewness	-0.01
Range	3
Minimum	2
Maximum	5

**Figure 24: Subjects' Enthusiasm to Access PESTLEWeb Models Produced by Other People**

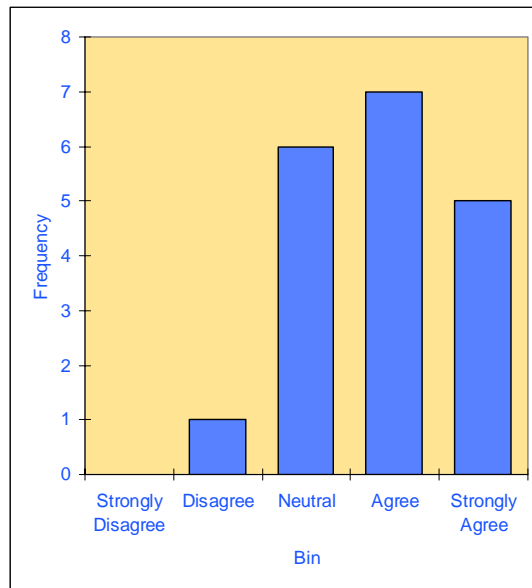
Question 7) I would be willing to share my PESTLEWeb models with other people



<b>Question 7</b>	
Mean	3.53
Standard Error	0.23
Median	3.00
Mode	3.00
Standard Deviation	1.02
Sample Variance	1.04
Kurtosis	-1.00
Skewness	0.10
Range	3
Minimum	2
Maximum	5

**Figure 25: Subjects' Willingness to Share PESTLEWeb Models with Other People**

Question 8) PESTLEWeb would be useful to my business



<b>Question 8</b>	
Mean	3.84
Standard Error	0.21
Median	4.00
Mode	4.00
Standard Deviation	0.90
Sample Variance	0.81
Kurtosis	-0.77
Skewness	-0.18
Range	3
Minimum	2
Maximum	5

**Figure 26: Subjects' Views Concerning the Usefulness of PESTLEWeb to their Business**

#### 4.4.4.4 Sample size for Procedure 2a

In all, 20 questionnaires were submitted with one of these being only partially complete and hence un-usable. All of the statistics in the above section are descriptive and based on the population as measured, as opposed to being a sample for inferential purposes.

#### 4.4.4.5 Results relating to Kirkpatrick Level 4 transfer of learning

As stated in Section 4.4.2.4, workshop attendees were offered the chance of joining a CoP focused on the PESTLEWeb method. This CoP was convened via a LinkedIn Group, as shown in Figure 27. At the time of writing, the CoP had attracted 35 members, 31 of whom are Henley MBA students and the remainder are colleagues of the author.

After the workshop, a number of PESTLEWeb CoP members developed their own PESTLEWeb models, either for personal interest or with the intention of submitting these as part of an assignment towards the Henley MBA. Examples of these models are included in Appendix C.

Each of these models has a significant level of detail both in terms of the number of issues identified and the logic that ties them together. It is somewhat difficult to judge

the quality of the analysis from these diagrams alone, since presumably that judgment would depend on the various authors' final conclusions and inferences based on the use of the model. However, it can be said that the authors of these models have been able to execute them successfully; that is, they are syntactically and semantically 'correct' according to the PESTLEWeb drawing convention. Additionally, the authors have demonstrated their preference for using the PESTLEWeb method over traditional methods.

That the PESTLEWeb method has been adopted in this way, in a relatively short timescale and with little promotion, may be the most significant indicator of its usefulness.

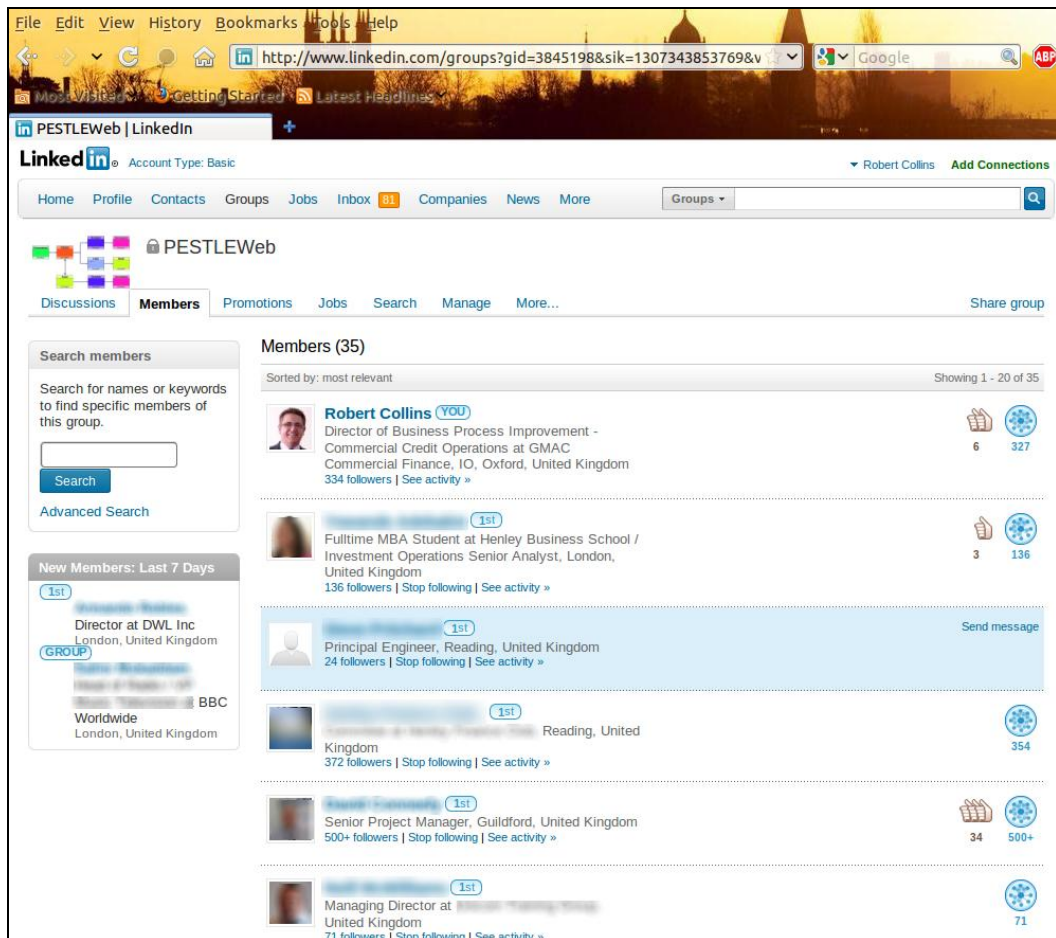


Figure 27: PESTLEWeb CoP Webpage

#### **4.4.4.6 Discussion of results and analysis of Procedure 2**

The mean response to each question in the pre-workshop questionnaire is close to 3. This suggests that an average subject in this study group is not currently experiencing great difficulties in the area of business environmental analysis. However, that a significant number of subjects scored at the mid-point of the scale suggests that, in follow-up studies, it would be useful to increase the number of options available or to remove the neutral mid-point (Cox, 1980; Garland, 1991).

However, a more important observation may be that a significant fraction of subjects responded in a 'negative' manner. Thus, 42% of subjects either disagreed or strongly disagreed with the statement "My company has a well-developed system in place for scanning the business environment" (Question 1). This result would be broadly in line with the industry survey reported by Day and Schoemaker (2006). 32% of subjects either disagreed or strongly disagreed with the statement "I think that PESTLE analysis gives me deep insights into the context for my business" (Question 4). 21% of subjects either disagreed or strongly disagreed with the statement "I find it easy to explain the context of my business to others" (Question 5). It is a value judgment as to what a desirable distribution to these questions might be. However, it does not seem unreasonable to suggest that a business school would consider it desirable for business students on an advanced course of study in this domain to respond more positively, i.e. with a mean well above the 'neutral' position and significantly fewer responses in the negative region. Thus, particularly in respect to Question 4, it would be desirable to equip students with a method of analysis which they judged to provide them deep insights into the context of their business.

It is recognised, of course, that such a self-assessment questionnaire is clouded by opinion over fact. Thus, although a respondent might lack confidence in their ability to perform deep analysis, their performance in reality may exceed their expectations. Again, however, presumably a business school would desire an autoepistemic outcome in which the student both knew how to perform an accurate analysis and was confident in their own abilities. This state is not reflected in a significant proportion of the respondents to the pre-workshop questionnaire.



Considering the post-workshop questionnaire, we can note that the mean level of response for each question is above the neutral position. Whilst there are some negative responses (e.g. two respondents either disagreed or strongly disagreed with the statement “I found the PESTLEWeb method straightforward to understand”), a review of the graphs in Figure 19 to Figure 26 indicates a marked preference for responses in the ‘positive’.

Concerning the direct comparison of the PESTLEWeb method to the traditional PESTLE method, Question 2 showed 79% of subjects either agreeing or strongly agreeing with the statement “A PESTLEWeb model provides a better explanation of the business environment than traditional PESTLE”. Similarly, 79% of subjects either agreed or strongly agreed with the statement “Using PESTLEWeb would improve the quality of my analysis of the business environment.”

In relation to level 3 of Kirkpatrick’s model (Table 5), 68% of subjects indicate an intention to adopt the use of the PESTLEWeb method in their academic studies (Question 4: “I will use the PESTLEWeb method for my future MBA assignments”).

Cronbach’s Alpha for the complete set of post-workshop questions is 0.82, showing that they have a high degree of internal consistency and suggesting that they are measuring a single construct. As described in Section 4.4.2.3, this construct is intended to address Level 2 and Level 3 of the Kirkpatrick hierarchy and be an indication of both the value of the acquired knowledge and the likelihood of future application

In summary then, the pre-workshop results show that, whilst ‘on average’ students are not experiencing particular issues in the domain of business environmental analysis, nevertheless a significant proportion are. The pre-workshop results are probably not aligned with a desirable position from the point of view of a business school. The post-workshop results provide a consistent indicator that the proposed PESTLEWeb method has advantages over existing methods measured in regard of a nexus of items relating to ease of learning, depth of analysis and likelihood of future use.

## **4.5 Conclusion and recommendations**

The two studies described above together address the efficacy of the PESTLEWeb tool from two directions. Firstly, a classical ‘between-groups’ style experiment was conducted to determine if there were any statistically significant differences between the presentation of business environmental information in the form of a PESTLEWeb model as compared with a more traditional text format. This investigation aimed to determine whether there were differences both in either cognitive or affective responses between two groups. Secondly, an ‘observational’ study, supported by pre- and post-workshop questionnaires, was conducted to provide supporting evidence (or otherwise) that the PESTLEWeb model could be usefully applied in a business school teaching setting

As described in previous sections, the first of these procedures had the advantage of the potential to provide statistically significant measures of difference, under well-controlled experimental conditions. The disadvantage of this procedure was, however, that it was only able to investigate a relatively narrow set of conditions and responses given the available time and resource limitations. The second procedure provided qualitative evidence in a more realistic teaching setting. It can be regarded as a legitimate trial of the use of PESTLEWeb but, of course, it would be invalid to generalise these results to other settings, other student groups and other tutors.

### **4.5.1 Conclusion and recommendations arising from Procedure 1**

The results of the experimental study showed no significant difference in recall of models presented in PESTLEWeb form vs. traditional text. There was, however, a strongly statistically significant difference between the two groups in terms of affective variables. Simply put, subjects believed that the PESTLEWeb models were more persuasive, engaging and rational than a traditional text presentation.

It is useful to deconstruct these two results. Firstly, why might we expect subjects to remember more from the PESTLEWeb model, and why is it that in fact they do not? Perhaps biased by the familiar aphorism “A picture is worth a thousand words” we are led to the ‘intuitive’, and yet incorrect, view that pictures are intrinsically more memorable than the written word. However, this view is not born out in the literature of

cognitive psychology (Craik and Tulving, 1975; Craik and Lockhart, 2008), nor by the experimental investigation presented in this thesis. The theory and evidence instead points towards the process of remembering rather than intrinsic characteristics of the thing remembered. As discussed in Section 3.3.1, an essential element of improved memory and subsequent recall is active transformation by the learner.

Thus, an obvious suggestion for subsequent experimentation would be to investigate if there are significant differences in recall when subjects construct their own PESTLEWeb models rather than have them presented in their fully constructed state. However, such an experiment would itself suffer from some difficulties. Even establishing a significant difference in these circumstances would not distinguish PESTLEWeb over any other form of transformation (for example, constructing a rhyme or drawing a mindmap) and without further work it would do no more than add weight to the arguments of Craik and Lockhart (1975, 2008). Thus, whilst this is an attractive direction for further investigation, it is a non-trivial one.

There is another complicating factor in the experimental tests of memory and recall using PESTLEWeb. Subjects engaged in the experiment were unfamiliar with the notation; they had not learnt it, nor had they practiced using it. Thus, there was a significant level of unfamiliarity with the task. Subjects in the experiments were both learning to interpret a PESTLEWeb model with no prompting or pre-training and also attempting to remember the content of the presented model. It could easily be that the cognitive difficulty associated with the interpretation and learning task effectively offset any potential advantages in memory.

This condition again encourages further experimentation, for example by exposing subjects to tutorial material to enable them to gain familiarity with the notation. After the model of de Groot, we might expect that experts would have better memory of the models than novices as a result of familiarity and ability to ‘chunk’ elements of the model into familiar sub-components and patterns (de Groot, 1978). This would be an attractive notion of course; if business students could be taught a generalisable, extensible modelling tool in their early years of study it could then be used as a medium for presenting more complex arguments in economics, business environment and strategy later on.

Considering the cognitive aspects of PESTLEWeb, there was no attempt made here to replicate the work of Bauer and Johnson-Laird (1993). That is, it would be interesting to test specifically if subjects are more or less able to make logical deductions and inferences from a PESTLEWeb model than from a text-only presentation. Nonetheless, whilst a direct replication of Bauer and Johnson-Laird using PESTLEWeb models would be relatively straightforward, the results would again be limited; the original experiment considered rather specific and ‘difficult to understand’ logical statements involving double disjunctions. It is not obvious that a direct replication of the study would shed light on more common reasoning tasks within the domain of business environmental analysis. A more general investigation of students’ ability to reason using the PESTLEWeb tool would, however, be an attractive line of investigation for future work.

We turn now to the measure of affective variables, which are important in their own right (to be of practical use, users would need to find them convincing, rational etc.), but also important to the extent they contribute to level 3 and 4 outcomes in the Kirkpatrick Learning Evaluation model shown in Table 5 (Kirkpatrick and Kirkpatrick, 2009). Whilst there was a statistically significant result, we might ask what exactly that result was. Subjects judged the PESTLEWeb models to be more convincing than those people exposed to the text stimulus. This is not to say, of course, that the models were *actually* more convincing. There are a number of reasons why subjects might have assessed the PESTLEWeb model as being more convincing, not least of all compliance effects that might lead students to conclude that they ‘should’ judge these models as more convincing. Another useful avenue of experimentation should be to test if subjects were actually more convinced by the argument presented in a PESTLEWeb rather than a text-based argument. Such an experiment would be a natural and straightforward extension to the experiment described in this thesis, in which subjects would be asked to indicate their level of agreement with conclusions under the two experimental conditions. Again, following on from the discussion above, such an investigation would have to deal with any learning effect associated with an initial use of the tool.

Thus, a key recommendation arising from the experimental section of this study is to continue with further experiments. Such experiments would serve to tease out the exact

nature of any advantages or disadvantages in PESTLEWeb in particular, and the use of visual argumentation in general in the context of business in education and in practice.

#### **4.5.2 Conclusion and recommendations arising from Procedure 2**

The pre-workshop questionnaire for Procedure 2 revealed that significant numbers of subjects had a negative experience of previous methods. For example, around half of subjects considered that their company did not have a well-developed system for scanning the business environment (confirming the results of Day and Schoemaker, 2006). Views as to whether traditional keyword-driven PESTLE provided deep insights were evenly split, with as many subjects 'strongly agreeing' as 'strongly disagreeing'. These results certainly suggest that this is a worthwhile area to investigate.

Procedure 2 demonstrated that PESTLEWeb could indeed be taught, in a reasonably short time, in a classroom setting at a business school. The post-workshop questionnaire results were strongly weighted towards the positive end of the response ranges for all questions. The follow-up study showed that some students were able to use PESTLEWeb productively to construct relatively sophisticated models of the business environment.

These results, however, are also open to criticism. That the tool can be taught in one setting, by one tutor, to one class does not guarantee that the tool could be introduced universally in a business school setting. To substantiate this argument would require the tool to be piloted by other tutors and in other settings.

Moreover, that some students adopt the tool and appear to use it effectively is no guarantee of universal efficacy. For example, this was a self-selecting group. There is every possibility that those students who were most highly motivated and most attracted to systematic, analytical tasks elected to use the tool. This evidence therefore provides little information about the likely effects of the tool being introduced to a general audience of business school students. For example, for less able students, the added overhead of learning the methodology might actually work against their ability to perform useful analysis.

We have also not seen the grade results for students adopting the PESTLEWeb method. That students choose to use the tool, and produced 'complex' models, is no guarantee that an independent review by an assignment assessor will give a favourable result. For this to be achieved, several further conditions need to be in place. Students need to be able to re-synthesise their analysis into coherent conclusions that find favour with assessors. Assessors themselves would need to understand the PESTLEWeb notation and be able to follow the arguments presented (bearing in mind however that students were advised to 'translate' their conclusions from the analysis into a normal discursive form rather than leaving them as a PESTLEWeb graphic).

Finally, the 'opportunity cost' associated with constructing a PESTLEWeb model needs to be considered. For example, it may well be that the insights provided by a 'light-weight' analysis of the environment may be sufficient to proceed with effective strategy development, where effort might be more liberally applied. The introduction to this thesis presents the arguments for why this should not be so, arguing that 'deep' environmental analysis is indeed warranted.

### **4.5.3 Final recommendations**

The final recommendations arising from this thesis are intended to address the two primary issues identified within the review of current thinking in Section 3, that:

1. Scanning of the business environment is of critical importance to business (Barney, 1991, Albright, 2004); and
2. The task is frequently not done well or not done at all (Schoemaker and Day, 2009).

The review of current thinking and the investigations within this thesis have provided a strong candidate to address these issues. However, more work needs to be done to further develop understanding in this domain and to promote the practical application of solutions.

In particular, it is recognised that there will always be limitations when somebody sets out to evaluate a tool or method that they have created themselves. Whether intentionally or purposefully, there is an opportunity for skewed results. Considering this, a key recommendation is that the work of this thesis be subject to replication by independent researchers. Indeed, there is an opportunity here for other Henley MBA students to replicate, adapt and test both PESTLEWeb and the whole class of graphical techniques as part of their own work.

Thus, it is recommended that step-wise piloting and introduction of the PESTLEWeb method should be continued under conditions of careful monitoring, i.e. a process of incremental expansion of the use of the tool, coupled with further empirical and observational research. An incremental programme of research and application would present a low-risk route towards adoption and use of the method.

Thus, an incremental process is proposed, as follows:

1. Gather feedback from assignment markers for the MBA ‘Strategic Direction’ (SD) and ‘Global Business Environment’ (GBE) sections of the course to discover their responses to the use by students of the PESTLEWeb method.
2. Run a series of further pilot workshops for the method as addenda to the existing SD and GBE courses at Henley.
3. Present a research seminar to tutors and other academics at Henley to introduce the method and gather further critical feedback.
4. Provide tutorial information on the PESTLEWeb method via the Academic Resource Centre at Henley.
5. Encourage independent replication and validation of the method.
6. Formally move to introduce the method as part of core teaching of SD, GBE and during introductory modules for the MBA.
7. Complete further observational and empirical studies, including:
  - a. PESTLEWeb’s efficacy – for example, its effect on reasoning rather than memory and long-term follow up on student performance; and

- b. Comparative studies with more or less complex notations.( See the comments comparing PESTLEWeb with the Toulmin model of argumentation in Section 3.3.2)
8. Seek to promulgate the results of the PESTLEWeb research at conferences and in academic journals with the intended aim of promoting the acceptance and widespread use of the method beyond Henley Business School.

#### **4.5.4 Final conclusion**

This thesis has recognised the key importance of deep and timely knowledge of the business environment for strategy development and effective, continuing execution. Importantly, issues relating to effectiveness of the environmental modelling task have been identified both in professional practice and in business education. Reports in the literature of a failure of businesses to engage in effective environmental scanning have been corroborated in this thesis by evidence gathered in a workshop session with MBA students.

This thesis has introduced a new method for modelling the business environment, called PESTLEWeb. It has been argued that this method has several properties that increase its effectiveness as compared with traditional keyword-driven methods of identifying, analysing and synthesising business environmental knowledge. These positive properties of the new method have been investigated both experimentally and observationally in a workshop session. Whilst no evidence was found to indicate that a PESTLEWeb model was significantly more memorable than a text-based analysis, a measure of affective variables showed a strong, statistically significant preference for the new method. The observational study showed that the method could be introduced to an MBA class in a relatively short and straightforward workshop setting. It was shown that learners were able to understand and use the method to some extent within the workshop itself. Additionally, a longer-term follow up of a self-selecting group of students has demonstrated that some, at least, are able to develop sophisticated and rich models of the business environment using the PESTLEWeb method.

Recommendations from this thesis have proposed an incremental process of further investigation and academic engagement with the method with the ultimate aim of introducing it into business education.



## 5 Reflection

### 5.1 *Evaluation of findings in relation to current thinking*

I consider the most relevant published current thinking in this domain to be the work by Schoemaker and Day (2009). Their book *Peripheral Vision* makes excellent cases both for the role of environmental scanning in business strategy development and execution and also that this task is frequently performed poorly or not at all. Schoemaker and Day present some discussion about the interpretation of environmental information and make suggestions such as “Formulate multiple hypotheses”, “Encourage constructive conflict” and “Use dialogue to share the big picture”. They do not, however, provide a concrete methodology for enacting any of these.

For me, the most significant aspect of PESTLEWeb is its contribution to interpretation and understanding. PESTLEWeb is concerned with sense-making and theory building. The development and use of ‘tools’ to enable these processes has been a significant interest for me for more than two decades; a significant part of my PhD thesis concerned the development and use of extended metaphors to enable teachers to contextualise teaching experiences. Students and business leaders do not lack access to information about the business environment; they do, however, lack a methodology to first analyse the data in a rich manner and then re-synthesise this into a coherent theory.

A key theme of my own education and research work is that it has always been multi-disciplinary. The PESTLEWeb work builds on this and draws on literature from a variety of fields. For example, the process of theory building within PESTLEWeb has resonances with the processes of qualitative research and in particular the Grounded Theory of Glaser and Strauss (1999). The use of PESTLEWeb as a ‘tool for thinking’ draws on the work of Craik and Lockhart (1975) and de Groot (1978), which I first came across whilst completing research in a university psychology department. The use of graphical notations to build models representing complex realities is embedded in my own teaching in complex systems engineering and in the many graphical notations of modern computing, IT business analysis and software engineering (Shlaer and Mellor, 1992; Selic et al, 1994; Friedenthal et al 2009).

The PESTLEWeb work, of course, rests centrally on its application in the domain of business strategy development. The work of Klein and Newman (1980) on the SPIRE method provides a natural precursor to PESTLEWeb, as do the authors working in the area of cognitive maps (Eden, 1989, 1992; Eden et al, 1992; Bougon, 1992)

I believe it is important to note, however, that despite its relatively ‘formal’ appearance, PESTLEWeb is not primarily intended to be a rigorous and ‘logically correct’ modelling language in the sense those terms might be used by a computer scientist or mathematician. In contrast to the work of Klein and Neman, the PESTLEWeb method is not intended to be a predominantly ‘computational’ or ‘algorithmic’ method. Instead, it should be considered a ‘humanistic’ tool that has at its heart the human capabilities of grouping, arranging, structuring, story-telling, theory-building and communicating. PESTLEWeb models are stories through pictures, albeit that those pictures adopt a regular semiotic and syntax. The diagrams allude to formalism as an enabler to comprehension and communication, but they are not bound by it; for example, no great attention has been paid in this thesis to the exact semantics of the two classes of relationships depicted in the notation. That has not been necessary; PESTLEWeb rests at the balancing point between the recklessly casual and the restrictively causal.

I feel very enthusiastic in terms of the relationship of the research outcomes to the original management problem. There has been significant interest shown in the PESTLEWeb method during the course of this research project. This has been most clearly evinced by the workshop follow-up study described in Section 4.4.4.5. MBA students at Henley Business School are starting to use the method and there seems no reason why growth in the use of the method should not continue.

## **5.2 Experience of the research process**

Early on in this project I made a decision to complete both an experimental and an observational study. I recognised that the experimental work in particular was somewhat controversial in a business school environment. Whilst not explicitly excluded in the rules for the Management Challenge, neither was it highlighted as a likely option. I had not come across a single, relevant example of an experimental investigation in my

literature research (see the entry in my research diary for Thursday 16 September included at Appendix D).

Why then, select such a potentially difficult option? Firstly, in many respects, experimentation is not as difficult as it might appear. It afforded me the opportunity to collect a significant amount of rigorous data in a short time. I predicted that two, two-hour sessions at Henley would enable me to collect rigorous, comparative data from sufficient numbers of subjects to produce statistically significant results (or to indicate that no such result was likely). Of course, the design and preparation took some significant effort, particularly given that the experiment was to be presented in a completely controlled and automated fashion. However, my skills were well developed in this area and it appeared to be a good option.

Secondly, in purely academic terms, experimentation provides a power for explanation and generalisation that far exceeds qualitative and/or observational research. I have a firm belief in the power of experiment and its ability to determine significant truths. The observation that little research in business appears to have been based on experiment is not sufficient cause to give up the method. It would be my contention (along with Pfeffer and Sutton (2006) and Schaffer and Thompson (1992) ) that business research would be all the better for a greater emphasis on rigorous evidence.

Before starting the research process, I was very confident that I had the ‘technical’ knowledge to complete the research. I was, however, very conscious that there were some significant differences between this research and the work I had previously done. For example, whilst I had performed experiments in a physical sciences laboratory and attended multiple courses on experimental psychology, I had never actually completed any sort of experimental work involving people. Additionally, although I had completed a significant amount of observational work as part of my PhD research, this was predominantly with individuals and focused on the use of computer-based learning. In that work, much of the data was generated from recording tools embedded in the software which was the subject of the research. The observational study was based around a training workshop presented to a group of postgraduates. This was a format I was very familiar with and was confident about when planning the work. However, in practice, when the time came to do both the experimental work and the observational

workshop session, I was quite anxious (see the entries in my research diary for Monday 4 October and Thursday 31 March included at Appendix D).

In retrospect, both the experimental and observational studies were more successful than I would have expected. Volunteers from the Henley MBA were extremely generous in taking part, the technology for the experiment worked well and the observational study had a lot of positive responses (see the entry in my research diary for Friday 1 April included at Appendix D).

My most significant regret was that I did not test actual reasoning ability using PESTLEWeb during the experimental portion of the work. This would have been a very natural extension of the work by Bauer and Johnson-Laird (1993). This does, however, afford the opportunity for further research.

### **5.3 Achievement of personal objectives**

This Management Challenge has been of significant benefit to achieving my personal objectives. The quotation from my original application form for the Henley MBA, included in Section 1.2, is worth repeating in this context:

*I have a great interest in teaching and research. I believe that some of my research background in complex systems engineering has applications within strategy development and corporate finance. ... I could see that doing an MBA would open opportunities for research and teaching.*

I see this research project as a significant stepping stone towards a more significant programme of work in this area. I have managed to import an area of knowledge which I am very familiar with and apply it in a new domain. I believe that the literature review in Section 3 substantiates the view that this application of previous work is both valid and useful. The work has also thrown up a range of further research questions and provided a foundation of information about the method itself.

A key objective of this research project was to produce a re-usable curriculum resource that could be used by Henley Business School. Appendix E provides a set of workshop material which has been trialled in a realistic setting; a Henley MBA class. The PESTLEWeb CoP website includes a variety of other resources, including drawing templates and extensive examples that are already being used by MBA students. The results of the observational study demonstrate the practicality of teaching and using this method.

In my original objectives for this research project, I had dismissed the idea that I would develop significantly in my ability to conduct research. This has not been entirely the case. In fact, I have learnt a significant amount about the practical application of experimentation in this area and the difficulty of performing such experiments.

I had, however, set as a core objective that this research project would create opportunities for further research at Henley Business School. At this point, I have every reason to be optimistic in this regard. I have had significant and positive support from both students and staff at Henley for the current work and there is a growing interest in the PESTLEWeb model. The submission of this thesis represents a significant milestone.

Word Count = 17,678

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**Appendix A: Response paper used for the experiment  
in Study 1**

**Please do not turn over the  
page until asked to do so**

**Please provide some background information about yourself...**

I am....                      Female                       Male                       (Tick one)

English is my **first** language:  
Yes                       No                       (Tick one)

My education has been focused on: (Tick as many as required)

Science       Languages                       Social Sciences                       Arts

Business       Medicine                       Engineering

When I learn new things, I prefer to get new information in the form of: (Tick one)

Written Words                       Pictures                       Spoken Words

I have a visual impairment that is not corrected by glasses (including colour blindness):

Yes                       No                       (Tick one)

**Based only on your understanding and memory of the information presented to you:**

1. What issue or issues were presented as causing a shift towards the purchase of fuel-efficient vehicles?

---

2. What issue or issues were presented as a consequence of a political issue?

---

3. What social issues were presented in the analysis?

---

4. What issues were presented that led directly to the final market opportunity?

5. What issues were presented as being the cause of the growing public awareness of green issues?

---

6. Please rate how persuasive you found the presentation by ticking **one** of the boxes below:

Not at all persuasive			Not very persuasive		Somewhat persuasive		Very persuasive		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

---

7. Please rate how engaging (interesting) you found the presentation by ticking one of the boxes below:

Not at all engaging			Not very engaging		Somewhat engaging		Very engaging		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

---

8. Please rate how logical/rational you found the presentation by ticking one of the boxes below:

Not at all logical			Not very logical		Somewhat logical		Very logical		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. In the space below, please try to replicate as much of the information as you can, in the same form in which it was presented.

- End of Response Paper -

## Appendix B: PESTLEWeb evaluation form from workshop

This evaluation is intended to get your feedback on the PESTLEWeb™ method and to find out if you think it will be useful for you.

### Before the Workshop

Please tick one box in response to each question

1) My company has a well-developed system in place for scanning the business environment

← Strongly disagree

Strongly agree →

2) I have found it easy to analyse the business environment as part of my MBA assignments

← Strongly disagree

Strongly agree →

3) I have found it easy to analyse the business environment for my MBA exam case studies

← Strongly disagree

Strongly agree →

4) I think that PESTLE analysis gives me deep insights into the context for my business

← Strongly disagree

Strongly agree →

5) I find it easy to explain the context of my business to others

← Strongly disagree

Strongly agree →

## At the end of the workshop

1) I found the PESTLEWeb™ method straightforward to understand	← Strongly disagree					Strongly agree →
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) A PESTLEWeb™ model provides a better explanation of the business environment than traditional PESTLE	← Strongly disagree					Strongly agree →
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Using PESTLEWeb™ would improve the quality of my analysis of the business environment	← Strongly disagree					Strongly agree →
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4) I will use the PESTLEWeb™ method for my future MBA assignments	← Strongly disagree					Strongly agree →
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5) I would like to learn more about the PESTLEWeb™ method	← Strongly disagree					Strongly agree →
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) I would like see PESTLEWeb™ models for my industry produced by others	← Strongly disagree					Strongly agree →
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) I would be willing to share my PESTLEWeb™ models with other people	← Strongly disagree					Strongly agree →
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8) PESTLEWeb™ would be useful to my business	← Strongly disagree					Strongly agree →
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**If you would like to learn more about this research and the PESTLEWeb™ method, please put your name and e-mail address below.**

**Name:** \_\_\_\_\_

**e-mail:** \_\_\_\_\_



## Appendix C: Examples of PESTLEWeb models developed by other people

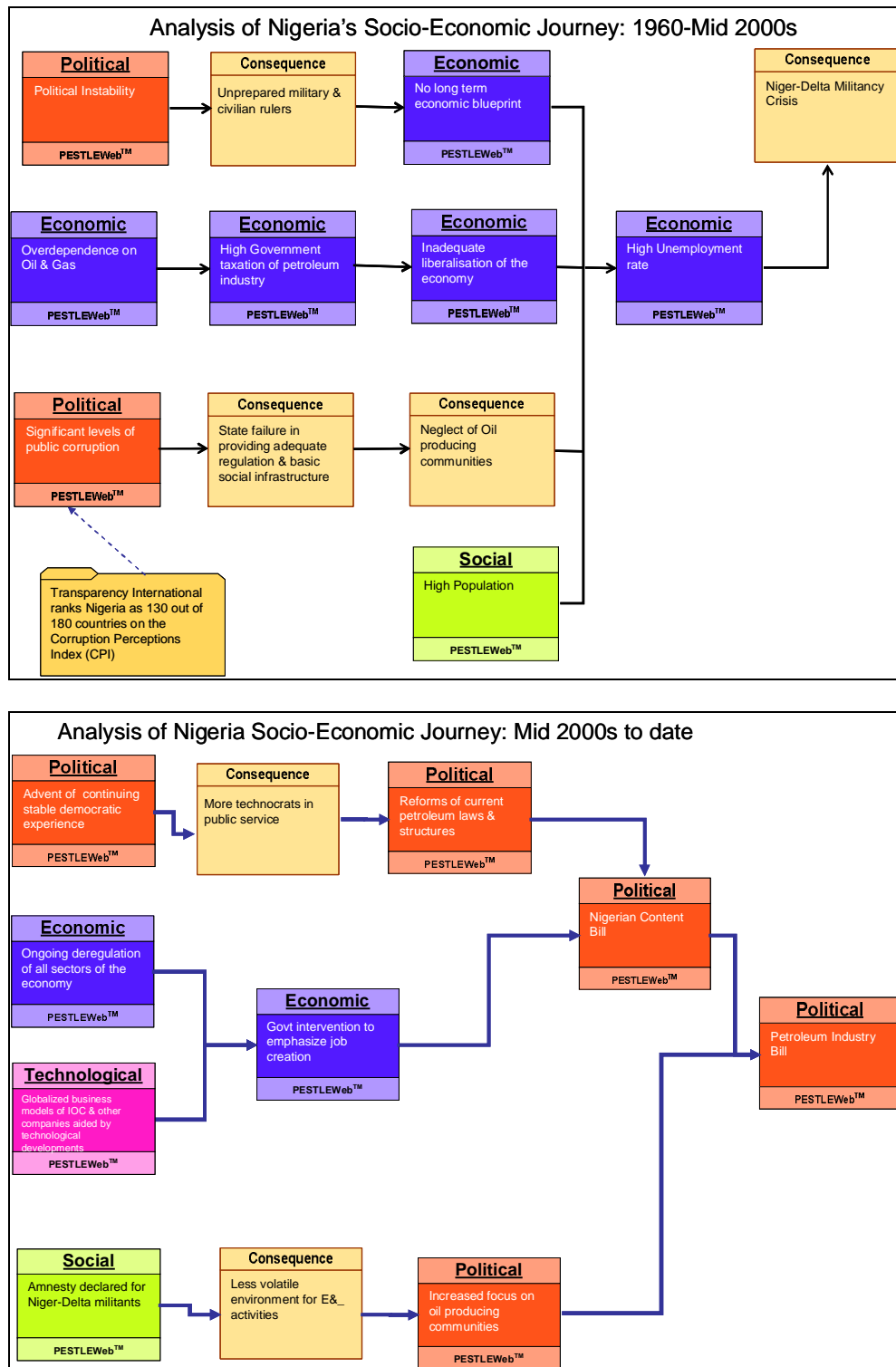


Figure 28: Two PESTLEWebs for 'Globalisation and Nigerian Content Development' Ladeji, D. (2011)

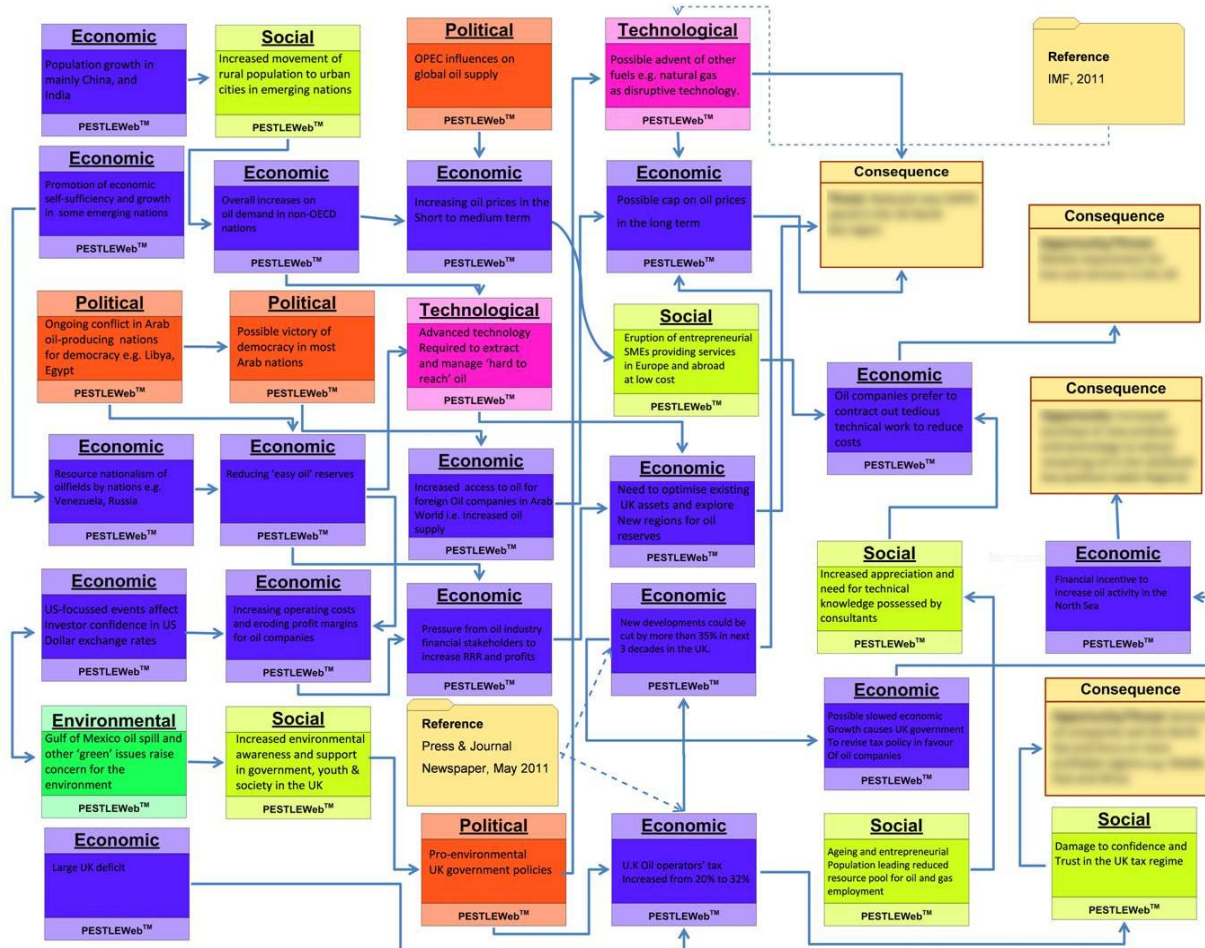


Figure 29: PESTLEWeb for the Oil Industry by Kemi Otaru, Henley MBA Student

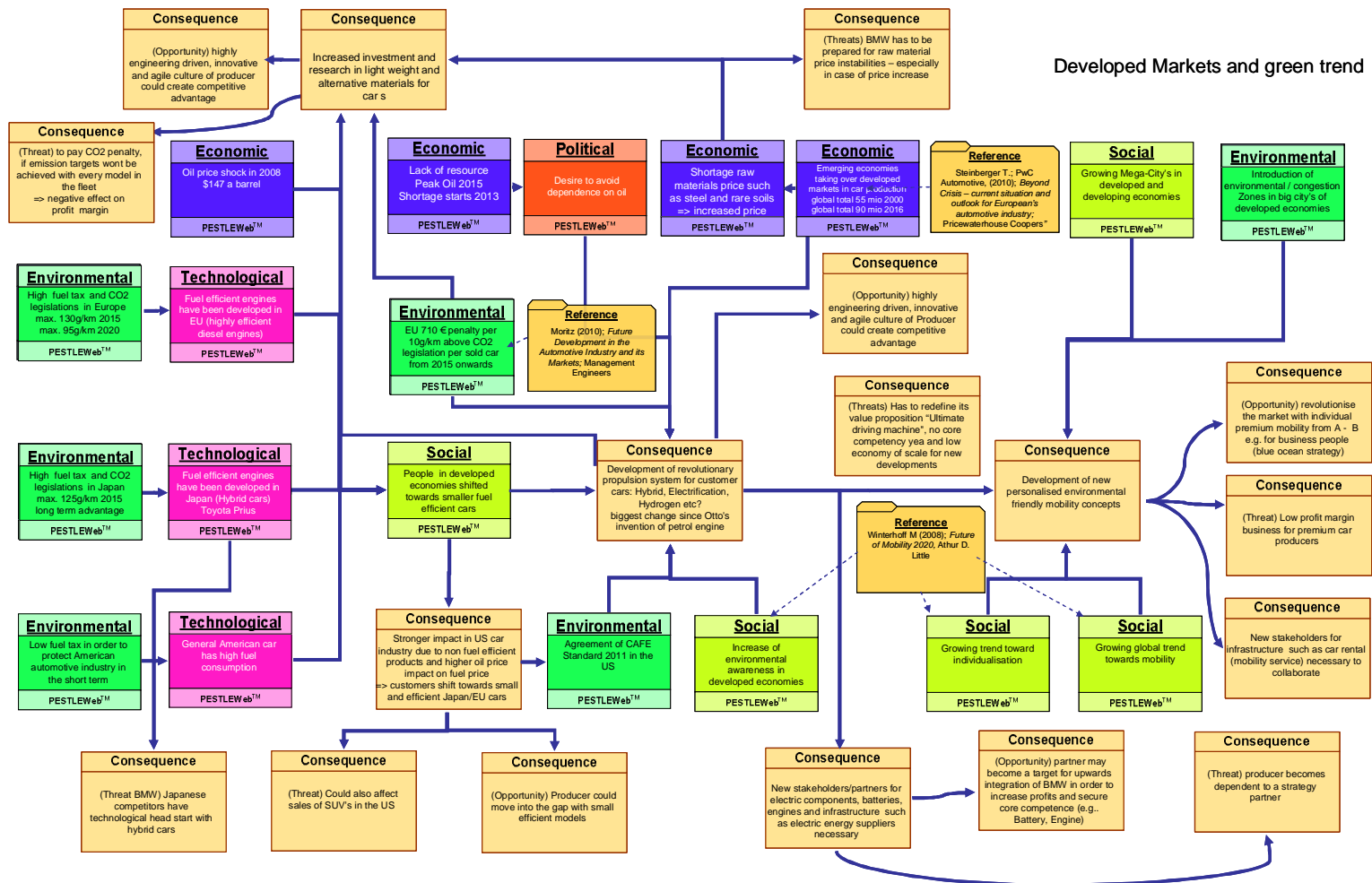


Figure 30: PESTLEWeb Model for the Car Industry (1), By Hermann Bauer, Henley MBA Student

## Financial Situation in developed

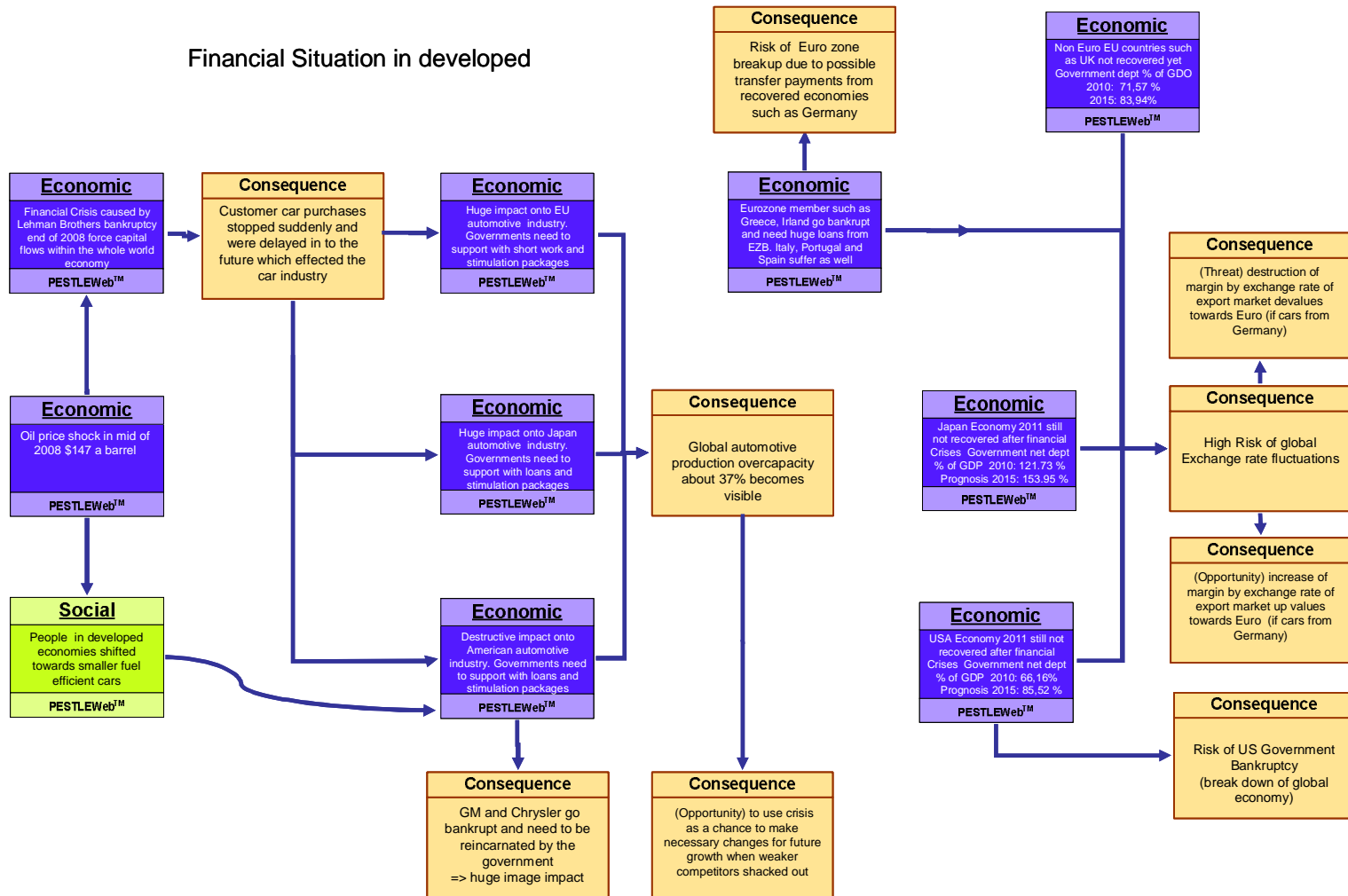


Figure 31: PESTLEWeb Model for the Car Industry (2), By Hermann Bauer, Henley MBA Student

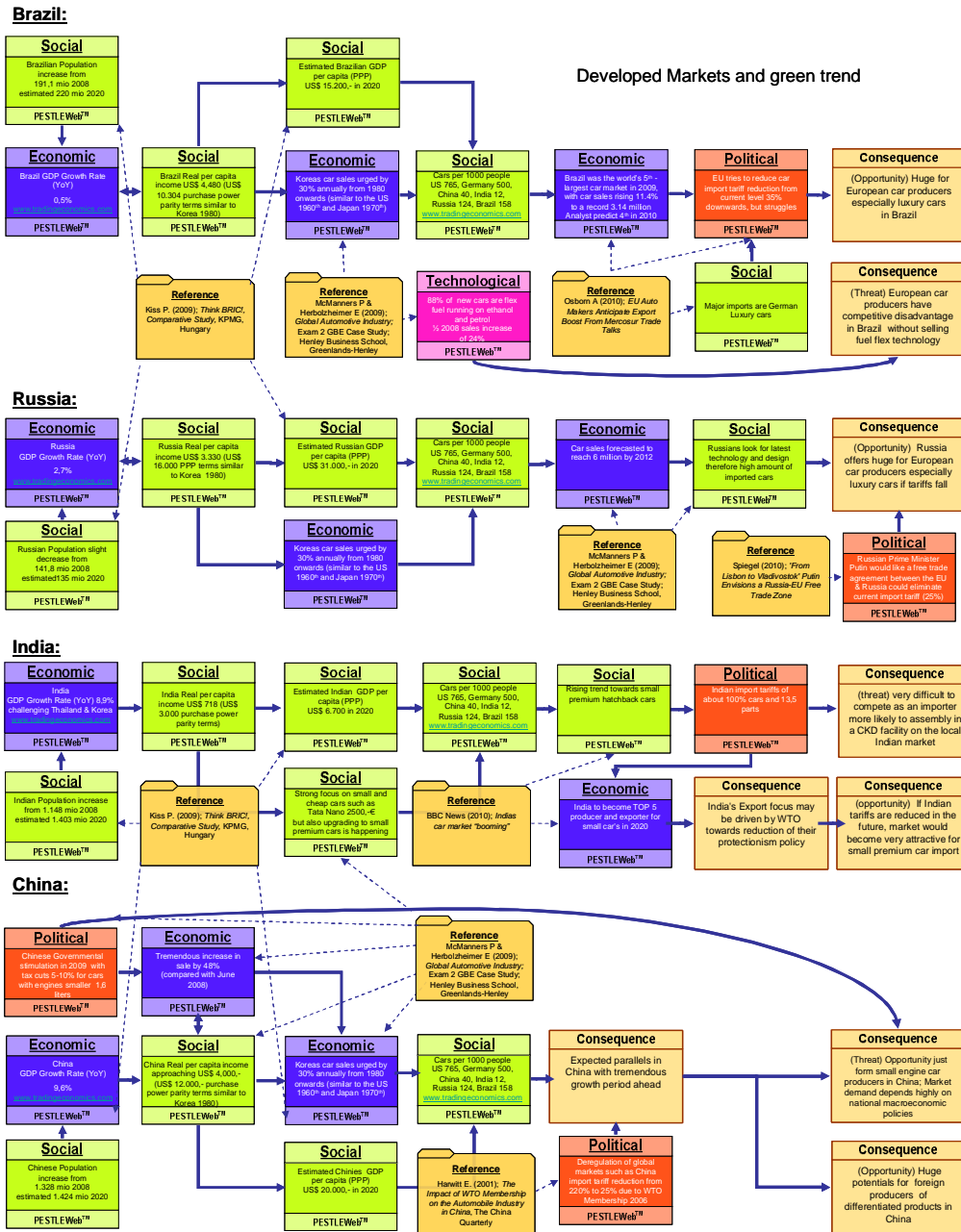


Figure 32: PESTLEWeb Model for the Car Industry (3), By Hermann Bauer, Henley MBA Student

## **Appendix D: Evidence from the management challenge log**

The following quotes are extracted from my Management Challenge Log and provide a representative view of the personal and process issues recorded there.

### **Wednesday 1 September**

I feel really excited as I kick-off this part of the MBA. I believe that there is an opportunity here both to 'tick the box' for the MBA but more importantly to do something meaningful for me. Having used the PESTLEWeb notation with the study team and for my own IMP I am confident in my own mind that I have something useful here. But I also know from experience from previous research that what is 'intuitively obvious' is frequently not always the case. Indeed, some of the most interesting science comes when the results are unexpected. Still, I see here a convergence between my academic and teaching work in complex systems, my background in psychology and computing (particularly IT-type business analysis) and some issues in the field of strategic analysis.

### **Thursday 16 September**

I really think that a series of experiments for PESTLEWeb is the right way to go. I have the experience, and I have neat method in mind to perform it – but will Henley accept this? The "Management Challenge Guide" does not exclude experiment but they are only mentioned once in the context of plagiarism ("Falsifying data, evidence, or experimental results"). The 'Manager as Investigator' study guide mentions experimentation in a number of places, and I think that the case would be arguable

### **Wednesday 27 September**

In my proposal, I planned to do an observational study as well as the experimental work. The issue is that I want the observational study to be as realistic as possible. I need to find out if somebody could actually teach an MBA class how to use this method in a relatively short space of time and have them use it effectively. I have the experience of teaching other, similar postgraduate students quite similar methods. For example,

teaching people how to use SysML to analyse complex systems. But MBA students are a different group. It is a stereotype but I imagine my technical students to be more familiar with graphical modelling and MBA students to perhaps be more experienced at making arguments verbally and in the form of essays. So, will the graphical methods work with this diverse group? Will there be significant individual differences? Maybe this is part of the interest for the MC – what ‘should’ work, may not work in practice. Even such results would be ‘interesting’ if rather disappointing.

### **Monday 4 October**

I am really starting to regret setting up this experiment. If the technology does not work then it will be a complete waste of time. I only have a very limited time-window to get these results and if it does not work I am in trouble. Additionally, what happens if insufficient people volunteer? The whole effort rests on this working and there are some serious risks.

### **Friday 29 October**

First run of the experiment today. I was nervous as hell, but so relieved to see that the technology all worked. As it was, it was simply a matter of getting people into the room, giving the ‘warm up’ script and setting the experiment to run itself. As a general method this is a great way to do classroom experimentation. It allows absolute control between two experimental conditions and (assuming the technology works), really reducing the stress of trying to give a presentation under experimental conditions.

### **Friday 10 December**

Completed the second run of the experiment with HB40 today. Great response! I am pretty sure I will have enough subjects now to show a statistical result, if any exists. If not – then I better start rethinking! I can process the number tomorrow.

### **Monday 14 March**

I think that I am all set for the workshop. Tass has agreed to help do some observation work for me, which makes me more relaxed about the process. I think that the presentation slides are looking OK and the case study is reasonably approachable. I would really like to be running a half-day workshop, which would give people more

time to get into the material. Also, is the case study realistic? It is one thing to be given this sort of material in a nice neat condensed form – but what about the ‘real-life’ situation of having to hunt down relevant information? I guess that is always the issue with case studies and probably why Henley favours real-world data rather than case studies. But that is a problem for later – I can’t let this workshop get too large to be practical.

### **Thursday 31 March**

I am doing the workshop at Henley tomorrow. It’s a fantastic opportunity, but I stand every chance of falling on my face. Why should any of the students hang around after a long day studying? What happens if they don’t get it? Or worse, they ‘get it’ but they don’t like it?

### **Friday 1 April**

I did the first real PESTLEWeb workshop today. It was a fantastic experience – it felt like coming full-circle since it was held in the same room as I attended my first kick-off workshop for the MBA. I really love doing this sort of teaching; with a really enthusiastic, smart bunch of people. Its not really ‘teaching’ at all; more like ‘facilitated learning’. Give the people the ideas and they pick them up and run with them. I was amazed and delighted at how many people stayed on at the end of the day for my workshop. Would I have been that generous? I remember being pretty tired at the end of my MBA workshops. But then I think I would have stayed myself. If nothing else I would have been intrigued by another MBA student trying to do this.

As expected I got mixed results from the workshop. Clearly some people were very switched on to it quite quickly. But then other people were less impressed. That is not so bad. If even a few people find this useful then it might get used more frequently. After all, this is a self-selecting group – nobody *has* to use the method.



## Appendix E: Workshop presentation on PESTLEWeb

**PESTLEWeb™**

A Graphical Method to Elicit, Explore, Explain  
and Document the Logic of the Current and  
Future Business Environment

Dr Rob Collins  
Henley Business School, MBAH39

*"Overall, a very good assessment of  
the Global Business Environment  
was presented.*

*A very good understanding of a range of  
GBE issues was displayed.*

*An excellent model was developed to  
assess the GBE and the  
inter-relationships between  
individual factors.*

**Why PESTLEWeb?**

- Takes the hard work out of writing the GBE section of your IMP assignment
- Allows you to produce an excellent analysis of the business environment
- Quick and easy to learn
- Turns a list of unrelated facts generated from a PESTLE checklist...
  - Into a well-structured argument
  - Convincing
  - Relevant

**Survey of 140 Major Corporations**

Response	Percentage
Surprised by more than 3 'High Impact Events'	67%
Not surprised	33%

DeJ, G.S. and Schoemaker, P.J.H. (2006)  
"Relevance Value: Detecting Weak Signals  
that Will Make or Break your Company"  
Harvard Business School Press

**Survey of 140 Major Corporations**

Response	Percentage
No early warning system	97%
Early warning system in place	3%

**Why not good-old PESTLE?**

*"In carrying out a PESTLE analysis it is all  
too easy to produce lists of factors, many  
of which may be of little or no importance  
in developing strategy...Developing a clear  
understanding of the cause-and-effect  
relationships between the factors in the  
PESTLE model is more challenging"*

*Tovstiga and Aylward (2008)*

**Why not good-old PESTLE?**

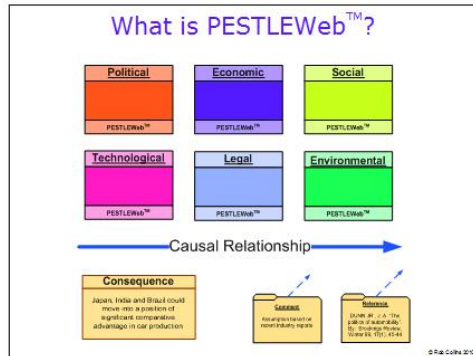
*"In carrying out a PESTLE analysis it is all  
too easy to produce lists of factors, many of  
which may be of little or no importance in  
developing strategy...Developing a clear  
**understanding of the cause-and-effect  
relationships** between the factors in the  
PESTLE model is more challenging"*

*Tovstiga and Aylward (2008)*

**PESTLE Issues**

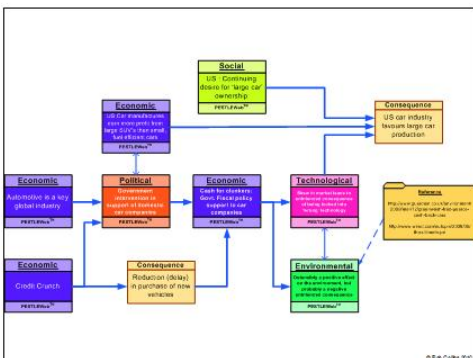
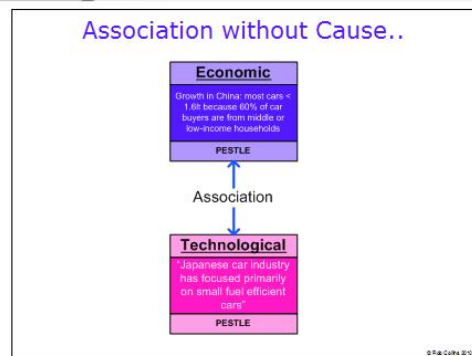
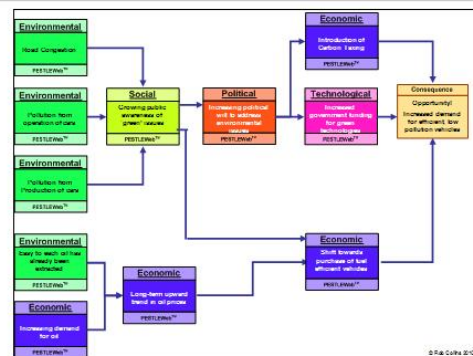
Global Business Environment  
Specific Industry  
Specific Business  
Your Strategy

- What...
  - is changing?
  - is important?
  - represents an opportunity?
  - represents a threat?



## Building a PESTLEWeb™ model for the 'Global Automotive Industry'

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- ### Activity
- Scan the 2-page case study of the global telecoms industry
  - Few minutes silent brainstorm
    - One issue per post-it
    - Label the post-it note clearly at the top
  - Affinity analysis
  - Look for 'threads'
- © F&B Corp. LLC

- ### Critically Review
- Now focus on a specific business:
    - A small, wireless network installation company
    - What new ideas come out of the analysis?
    - What are the consequences?
  - Review each issue:
    - What is changing?
    - What is important?
    - More causes?
    - More consequences?
    - What represents an opportunity?
    - What represents a threat?
    - Where do you need more information?
- © F&B Corp. LLC

- ### Example Assignment Text...
- "Figure 1 presents the issues of the global business environment that impinge on the automotive finance industry. The major themes arising from this analysis are:
1. Growth in population and affluence in the developing world (particularly the BRIC countries) creating a rapidly growing market for cars, and hence automotive finance (Barclay, 2010);
  2. Environmental, Social and Economic issues leading to higher growth rates for smaller, more fuel-efficient and less expensive cars, and hence changing the market focus for automotive finance (Dunn, 1999, White Book, 2009);
  3. Environmental (and hence social and political) issues creating a push for cleaner technologies, and hence creating opportunities for non-automotive finance products (E.g. to provide loans for home wind-power appliances.) (Scott, and Morales, 2010);"
- © F&B Corp. LLC

PESTLEWeb™ turns a list of unrelated facts into a

- Convincing ..
- Relevant ...
- Well-structured ..

...argument

© 2006 CERN

## Further Information..



- Join the 'PESTLEWeb' group on LinkedIn
  - Download the PESTLEWeb™ drawing template
  - Share PESTLEWeb™ models
  - Read about our current research
  - Learn more advanced PESTLEWeb™ methods

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# The End

For now.....

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